JMAP
REGENTS AT RANDOM

The NY Algebra 2/Trigonometry Regents Exams
Fall 2009-June 2013

www.jmap.org

Dear Sir

I have to acknolege the reciept of your favor of May 14. in which you mention that you have finished the 6. first books of Euclid, plane trigonometry, surveying & algebra and ask whether I think a further pursuit of that branch of science would be useful to you. there are some propositions in the latter books of Euclid, & some of Archimedes, which are useful, & I have no doubt you have been made acquainted with them. trigonometry, so far as this, is most valuable to every man, there is scarcely a day in which he will not resort to it for some of the purposes of common life. the science of calculation also is indispensible as far as the extraction of the square & cube roots; Algebra as far as the quadratic equation & the use of logarithms are often of value in ordinary cases: but all beyond these is but a luxury; a delicious luxury indeed; but not to be indulged in by one who is to have a profession to follow for his subsistence. in this light I view the conic sections, curves of the higher orders, perhaps even spherical trigonometry, Algebraical operations beyond the 2d dimension, and fluxions.

Letter from Thomas Jefferson to William G. Munford, Monticello, June 18, 1799.

Algebra 2/Trigonometry Regents at Random

1 In the diagram below, the length of which line segment is equal to the exact value of $\sin \theta$?
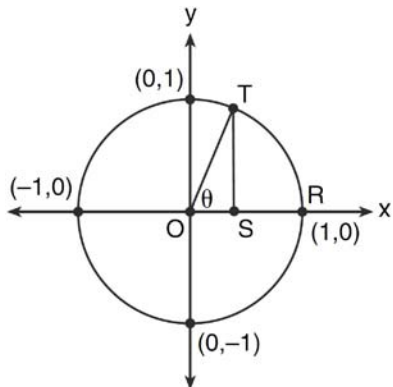
1) $\overline{TO}$
2) $\overline{TS}$
3) $\overline{OR}$
4) $\overline{OS}$

2 Which graph represents the solution set of $|6x - 7| \leq 5$?

1)

2)

3)

4)

3 A circle has a radius of 4 inches. In inches, what is the length of the arc intercepted by a central angle of 2 radians?
1) 2π
2) 2
3) 8π
4) 8

4 Which expression represents the third term in the expansion of $(2x^4 - y)^3$?
1) $-y^3$
2) $-6x^4 y^2$
3) $6x^4 y^2$
4) $2x^4 y^2$

5 When $\frac{3}{2}x^2 - \frac{1}{4}x - 4$ is subtracted from $\frac{5}{2}x^2 - \frac{3}{4}x + 1$, the difference is
1) $-x^2 + \frac{1}{2}x - 5$
2) $x^2 - \frac{1}{2}x + 5$
3) $-x^2 - x - 3$
4) $x^2 - x - 3$

6 Find the solution of the inequality $x^2 - 4x > 5$, algebraically.

7   If $f(x) = 4x - x^2$ and $g(x) = \dfrac{1}{x}$, then $(f \circ g)\left(\dfrac{1}{2}\right)$ is equal to

1) $\dfrac{4}{7}$

2) -2

3) $\dfrac{7}{2}$

4) 4

8   What are the sum and product of the roots of the equation $6x^2 - 4x - 12 = 0$?

1) sum $= -\dfrac{2}{3}$; product $= -2$

2) sum $= \dfrac{2}{3}$; product $= -2$

3) sum $= -2$; product $= \dfrac{2}{3}$

4) sum $= -2$; product $= -\dfrac{2}{3}$

9   The diagram below shows the plans for a cell phone tower. A guy wire attached to the top of the tower makes an angle of 65 degrees with the ground. From a point on the ground 100 feet from the end of the guy wire, the angle of elevation to the top of the tower is 32 degrees. Find the height of the tower, to the *nearest foot*.
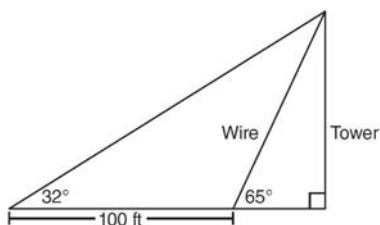

10 In the diagram below of right triangle JTM, $JT = 12$, $JM = 6$, and $m\angle JMT = 90$.
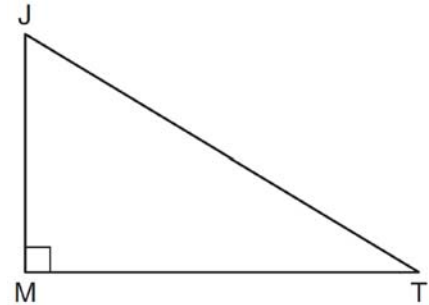
What is the value of cot J?

1) $\dfrac{\sqrt{3}}{3}$

2) 2

3) $\sqrt{3}$

4) $\dfrac{2\sqrt{3}}{3}$

11 As shown in the diagram below, fire-tracking station A is 100 miles due west of fire-tracking station B. A forest fire is spotted at F, on a bearing 47° northeast of station A and 15° northeast of station B. Determine, to the *nearest tenth of a mile*, the distance the fire is from *both* station A and station B. [N represents due north.]

2
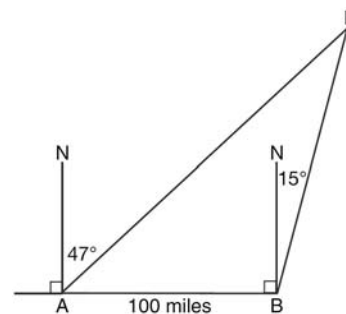
12 Written in simplest form, the expression $\dfrac{\dfrac{x}{4} - \dfrac{1}{x}}{\dfrac{1}{2x} + \dfrac{1}{4}}$

is equivalent to
1) $x - 1$
2) $x - 2$
3) $\dfrac{x - 2}{2}$
4) $\dfrac{x^2 - 4}{x + 2}$

13 What is the domain of the function
$f(x) = \sqrt{x - 2} + 3?$
1) $(-\infty, \infty)$
2) $(2, \infty)$
3) $[2, \infty)$
4) $[3, \infty)$

14 What is the solution set of the equation
$-\sqrt{2} \sec x = 2$ when $0° \le x < 360°$?
1) $\{45°, 135°, 225°, 315°\}$
2) $\{45°, 315°\}$
3) $\{135°, 225°\}$
4) $\{225°, 315°\}$

15 If $\log x^2 - \log 2a = \log 3a$, then $\log x$ expressed in terms of $\log a$ is equivalent to
1) $\dfrac{1}{2} \log 5a$
2) $\dfrac{1}{2} \log 6 + \log a$
3) $\log 6 + \log a$
4) $\log 6 + 2 \log a$

16 Which statement about the graph of the equation $y = e^x$ is *not* true?
1) It is asymptotic to the *x*-axis.
2) The domain is the set of all real numbers.
3) It lies in Quadrants I and II.
4) It passes through the point $(e, 1)$.

17 Express $\dfrac{\sqrt{108x^5 y^8}}{\sqrt{6xy^5}}$ in simplest radical form.

18 The graph below represents the function $y = f(x)$.
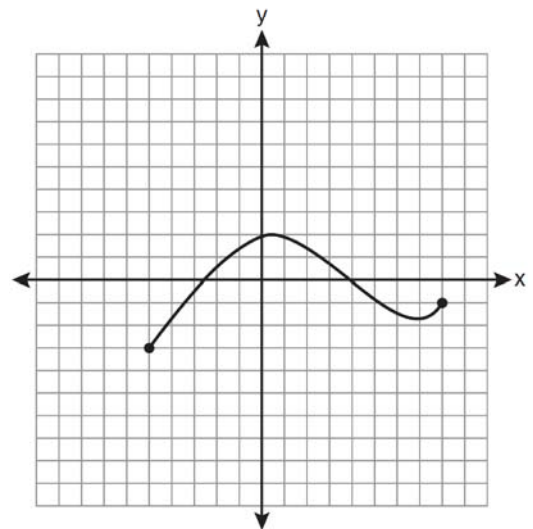
State the domain and range of this function.

19 Given $\triangle ABC$ with $a = 9$, $b = 10$, and $m\angle B = 70$, what type of triangle can be drawn?
1) an acute triangle, only
2) an obtuse triangle, only
3) both an acute triangle and an obtuse triangle
4) neither an acute triangle nor an obtuse triangle

20 How many distinct triangles can be formed if $m\angle A = 35$, $a = 10$, and $b = 13$?
1) 1
2) 2
3) 3
4) 0

21 Given the relation $\{(8,2),(3,6),(7,5),(k,4)\}$, which value of k will result in the relation *not* being a function?
1) 1
2) 2
3) 3
4) 4

22 Write an equation of the circle shown in the diagram below.
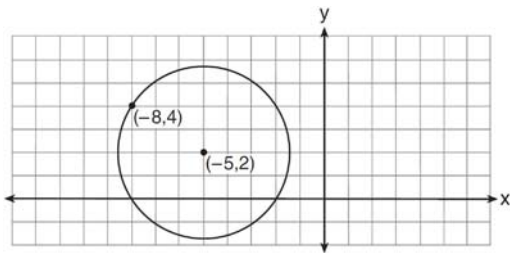
23 The lengths of 100 pipes have a normal distribution with a mean of 102.4 inches and a standard deviation of 0.2 inch. If one of the pipes measures exactly 102.1 inches, its length lies
1) below the 16th percentile
2) between the 50th and 84th percentiles
3) between the 16th and 50th percentiles
4) above the 84th percentile

24 The temperature, T, of a given cup of hot chocolate after it has been cooling for t minutes can best be modeled by the function below, where T_0 is the temperature of the room and k is a constant.
$$\ln(T - T_0) = -kt + 4.718$$
A cup of hot chocolate is placed in a room that has a temperature of 68°. After 3 minutes, the temperature of the hot chocolate is 150°. Compute the value of k to the nearest thousandth. [Only an algebraic solution can receive full credit.] Using this value of k, find the temperature, T, of this cup of hot chocolate if it has been sitting in this room for a total of 10 minutes. Express your answer to the *nearest degree*. [Only an algebraic solution can receive full credit.]

25 On the axes below, for $-2 \le x \le 2$, graph $y = 2^{x+1} - 3$.
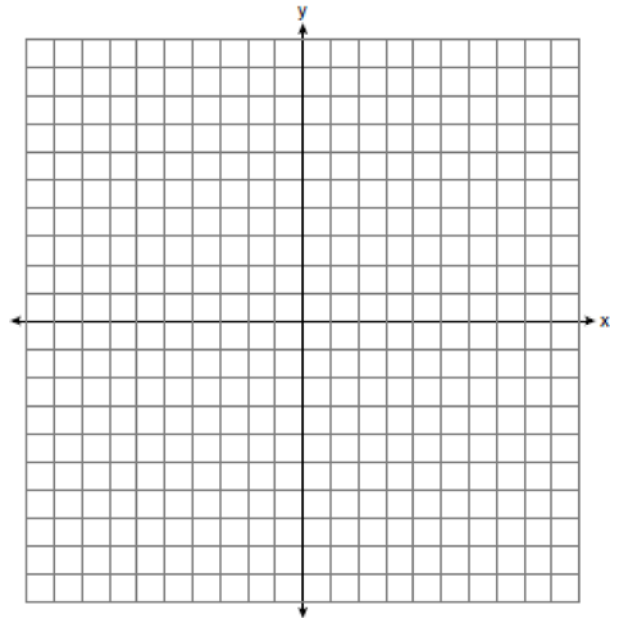
26 Three marbles are to be drawn at random, without replacement, from a bag containing 15 red marbles, 10 blue marbles, and 5 white marbles. Which expression can be used to calculate the probability of drawing 2 red marbles and 1 white marble from the bag?

1) $\dfrac{{}_{15}C_2 \cdot {}_5C_1}{{}_{30}C_3}$

2) $\dfrac{{}_{15}P_2 \cdot {}_5P_1}{{}_{30}C_3}$

3) $\dfrac{{}_{15}C_2 \cdot {}_5C_1}{{}_{30}P_3}$

4) $\dfrac{{}_{15}P_2 \cdot {}_5P_1}{{}_{30}P_3}$

27 There are eight people in a tennis club. Which expression can be used to find the number of different ways they can place first, second, and third in a tournament?

1) ${}_8P_3$
2) ${}_8C_3$
3) ${}_8P_5$
4) ${}_8C_5$

28 A blood bank needs twenty people to help with a blood drive. Twenty-five people have volunteered. Find how many different groups of twenty can be formed from the twenty-five volunteers.

29 For a given set of rectangles, the length is inversely proportional to the width. In one of these rectangles, the length is 12 and the width is 6. For this set of rectangles, calculate the width of a rectangle whose length is 9.

30 A four-digit serial number is to be created from the digits 0 through 9. How many of these serial numbers can be created if 0 can *not* be the first digit, no digit may be repeated, and the last digit must be 5?

1) 448
2) 504
3) 2,240
4) 2,520

31 A sequence has the following terms: $a_1 = 4$, $a_2 = 10$, $a_3 = 25$, $a_4 = 62.5$. Which formula represents the nth term in the sequence?

1) $a_n = 4 + 2.5n$
2) $a_n = 4 + 2.5(n-1)$
3) $a_n = 4(2.5)^n$
4) $a_n = 4(2.5)^{n-1}$

32 The expression $\dfrac{a^2 b^{-3}}{a^{-4} b^2}$ is equivalent to

1) $\dfrac{a^6}{b^5}$

2) $\dfrac{b^5}{a^6}$

3) $\dfrac{a^2}{b}$

4) $a^{-2} b^{-1}$

33 Find, to the *nearest minute*, the angle whose measure is 3.45 radians.

34 What is the solution set of the equation
$|4a + 6| - 4a = -10$?
1) $\varnothing$
2) $\{0\}$
3) $\left\{ \dfrac{1}{2} \right\}$
4) $\left\{ 0, \dfrac{1}{2} \right\}$

35 What is the common ratio of the geometric sequence shown below?
$$-2, 4, -8, 16, \ldots$$
1) $-\dfrac{1}{2}$
2) 2
3) -2
4) -6

36 Which expression always equals 1?
1) $\cos^2 x - \sin^2 x$
2) $\cos^2 x + \sin^2 x$
3) $\cos x - \sin x$
4) $\cos x + \sin x$

37 In parallelogram $BFLO$, $OL = 3.8$, $LF = 7.4$, and $m\angle O = 126$. If diagonal $\overline{BL}$ is drawn, what is the area of $\triangle BLF$?
1) 11.4
2) 14.1
3) 22.7
4) 28.1

38 What is the fourth term in the expansion of $(3x - 2)^5$?
1) $-720x^2$
2) $-240x$
3) $720x^2$
4) $1,080x^3$

39 The probability that the Stormville Sluggers will win a baseball game is $\dfrac{2}{3}$. Determine the probability, to the *nearest thousandth*, that the Stormville Sluggers will win *at least* 6 of their next 8 games.

40 How many different six-letter arrangements can be made using the letters of the word "TATTOO"?
1) 60
2) 90
3) 120
4) 720

41 The solution set of the inequality $x^2 - 3x > 10$ is
1) $\{x|-2 < x < 5\}$
2) $\{x|0 < x < 3\}$
3) $\{x|x <-2 \text{ or } x > 5\}$
4) $\{x|x <-5 \text{ or } x > 2\}$

42 The expression $(3 - 7i)^2$ is equivalent to
1) $-40 + 0i$
2) $-40 - 42i$
3) $58 + 0i$
4) $58 - 42i$

6

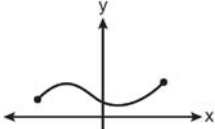43 Determine the sum and the product of the roots of $3x^2 = 11x - 6$.
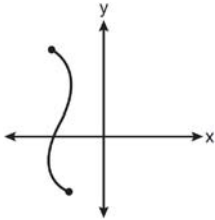
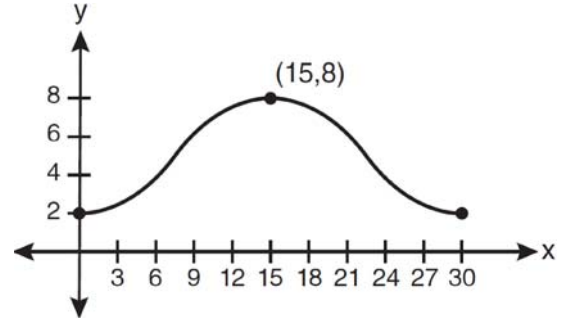44 Which graph does *not* represent a function?
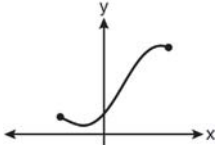
1)
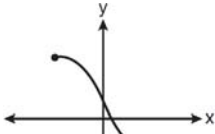
2)

3)

4)

45 If $\log 2 = a$ and $\log 3 = b$, the expression $\log \dfrac{9}{20}$ is equivalent to
1) $2b - a + 1$
2) $2b - a - 1$
3) $b^2 - a + 10$
4) $\dfrac{2b}{a+1}$

46 Which equation is graphed in the diagram below?

1) $y = 3\cos\left(\dfrac{\pi}{30}x\right) + 8$
2) $y = 3\cos\left(\dfrac{\pi}{15}x\right) + 5$
3) $y = -3\cos\left(\dfrac{\pi}{30}x\right) + 8$
4) $y = -3\cos\left(\dfrac{\pi}{15}x\right) + 5$

47 If $\sin A = \dfrac{2}{3}$ where $0° < A < 90°$, what is the value of $\sin 2A$?
1) $\dfrac{2\sqrt{5}}{3}$
2) $\dfrac{2\sqrt{5}}{9}$
3) $\dfrac{4\sqrt{5}}{9}$
4) $-\dfrac{4\sqrt{5}}{9}$

48 Solve algebraically for x:
$$\sqrt{x^2 + x - 1} + 11x = 7x + 3$$

7

49 What is the fifteenth term of the sequence
    $5, -10, 20, -40, 80, \ldots$?
    1) $-163,840$
    2) $-81,920$
    3) $81,920$
    4) $327,680$

50 The heights, in inches, of 10 high school varsity
    basketball players are 78, 79, 79, 72, 75, 71, 74, 74,
    83, and 71. Find the interquartile range of this data
    set.

51 Which function is *not* one-to-one?
    1) $\{(0,1),(1,2),(2,3),(3,4)\}$
    2) $\{(0,0),(1,1),(2,2),(3,3)\}$
    3) $\{(0,1),(1,0),(2,3),(3,2)\}$
    4) $\{(0,1),(1,0),(2,0),(3,2)\}$

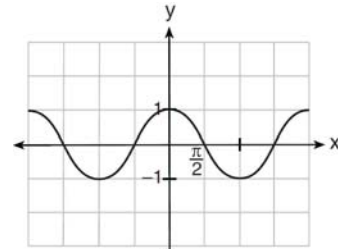52 What are the values of θ in the interval
    $0° \le \theta < 360°$ that satisfy the equation
    $\tan\theta - \sqrt{3} = 0$?
    1) $60°, 240°$
    2) $72°, 252°$
    3) $72°, 108°, 252°, 288°$
    4) $60°, 120°, 240°, 300°$

53 Which arithmetic sequence has a common
    difference of 4?
    1) $\{0, 4n, 8n, 12n, \ldots\}$
    2) $\{n, 4n, 16n, 64n, \ldots\}$
    3) $\{n+1, n+5, n+9, n+13, \ldots\}$
    4) $\{n+4, n+16, n+64, n+256, \ldots\}$

54 Which is a graph of $y = \cot x$?

1)
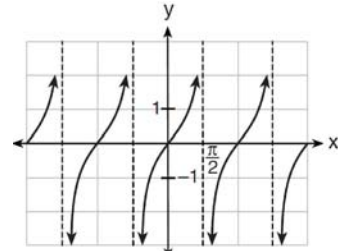
2)

3)

4)

55 The number of bacteria present in a Petri dish can
    be modeled by the function $N = 50e^{3t}$, where N is
    the number of bacteria present in the Petri dish
    after t hours. Using this model, determine, to the
    nearest hundredth, the number of hours it will take
    for N to reach 30,700.

56 The yearbook staff has designed a survey to learn student opinions on how the yearbook could be improved for this year. If they want to distribute this survey to 100 students and obtain the most reliable data, they should survey
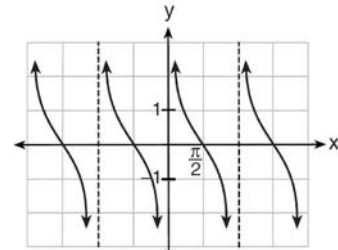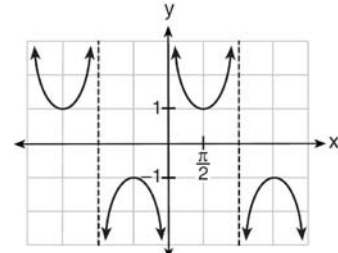1) every third student sent to the office
2) every third student to enter the library
3) every third student to enter the gym for the basketball game
4) every third student arriving at school in the morning

57 The roots of the equation $x^2 - 10x + 25 = 0$ are
1) imaginary
2) real and irrational
3) real, rational, and equal
4) real, rational, and unequal

58 If $\sec(a + 15)° = \csc(2a)°$, find the smallest positive value of a, in degrees.

59 Convert 3 radians to degrees and express the answer to the *nearest minute*.

60 For which equation does the sum of the roots equal −3 and the product of the roots equal 2?
1) $x^2 + 2x - 3 = 0$
2) $x^2 - 3x + 2 = 0$
3) $2x^2 + 6x + 4 = 0$
4) $2x^2 - 6x + 4 = 0$

61 Evaluate: $\sum_{n=1}^{3}(-n^4 - n)$

62 Express in simplest form: $\sqrt[3]{\dfrac{a^6 b^9}{-64}}$

63 The expression $(x + i)^2 - (x - i)^2$ is equivalent to
1) 0
2) −2
3) $-2 + 4xi$
4) $4xi$

64 A population of rabbits doubles every 60 days according to the formula $P = 10(2)^{\frac{t}{60}}$, where P is the population of rabbits on day t. What is the value of t when the population is 320?
1) 240
2) 300
3) 660
4) 960

65 Which values of x are solutions of the equation $x^3 + x^2 - 2x = 0$?
1) $0, 1, 2$
2) $0, 1, -2$
3) $0, -1, 2$
4) $0, -1, -2$

9

66 A population of single-celled organisms was grown in a Petri dish over a period of 16 hours. The number of organisms at a given time is recorded in the table below.

Time, hrs (x)	Number of Organisms (y)
0	25
2	36
4	52
6	68
8	85
10	104
12	142
16	260

Determine the exponential regression equation model for these data, rounding all values to the *nearest ten-thousandth*. Using this equation, predict the number of single-celled organisms, to the *nearest whole number*, at the end of the 18th hour.

67 What is the solution of the equation $2\log_4(5x) = 3$?
1) 6.4
2) 2.56
3) $\dfrac{9}{5}$
4) $\dfrac{8}{5}$

68 Express the exact value of $\csc 60°$, with a rational denominator.

69 The expression $\dfrac{2x+4}{\sqrt{x+2}}$ is equivalent to
1) $\dfrac{(2x+4)\sqrt{x-2}}{x-2}$
2) $\dfrac{(2x+4)\sqrt{x-2}}{x-4}$
3) $2\sqrt{x-2}$
4) $2\sqrt{x+2}$

70 If the amount of time students work in any given week is normally distributed with a mean of 10 hours per week and a standard deviation of 2 hours, what is the probability a student works between 8 and 11 hours per week?
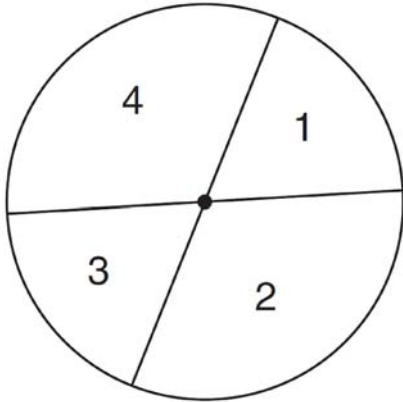1) 34.1%
2) 38.2%
3) 53.2%
4) 68.2%

71 If $\sin^{-1}\left(\dfrac{5}{8}\right) = A$, then
1) $\sin A = \dfrac{5}{8}$
2) $\sin A = \dfrac{8}{5}$
3) $\cos A = \dfrac{5}{8}$
4) $\cos A = \dfrac{8}{5}$

72 Find, to the *nearest tenth of a degree*, the angle whose measure is 2.5 radians.

73 A dartboard is shown in the diagram below. The two lines intersect at the center of the circle, and the central angle in sector 2 measures $\frac{2\pi}{3}$.

If darts thrown at this board are equally likely to land anywhere on the board, what is the probability that a dart that hits the board will land in either sector 1 or sector 3?

1) $\frac{1}{6}$

2) $\frac{1}{3}$

3) $\frac{1}{2}$

4) $\frac{2}{3}$

74 If $x^2 + 2 = 6x$ is solved by completing the square, an intermediate step would be

1) $(x + 3)^2 = 7$

2) $(x - 3)^2 = 7$

3) $(x - 3)^2 = 11$

4) $(x - 6)^2 = 34$

75 Solve $2x^2 - 12x + 4 = 0$ by completing the square, expressing the result in simplest radical form.

76 Which expression is equivalent to $\left(9x^2y^6 \right)^{-\frac{1}{2}}$?

1) $\frac{1}{3xy^3}$

2) $3xy^3$

3) $\frac{3}{xy^3}$

4) $\frac{xy^3}{3}$

77 If p varies inversely as q, and $p = 10$ when $q = \frac{3}{2}$, what is the value of p when $q = \frac{3}{5}$?

1) 25

2) 15

3) 9

4) 4

78 What is the product of $\left(\frac{x}{4} - \frac{1}{3} \right)$ and $\left(\frac{x}{4} + \frac{1}{3} \right)$?

1) $\frac{x^2}{8} - \frac{1}{9}$

2) $\frac{x^2}{16} - \frac{1}{9}$

3) $\frac{x^2}{8} - \frac{x}{6} - \frac{1}{9}$

4) $\frac{x^2}{16} - \frac{x}{6} - \frac{1}{9}$

79 What is the fourth term in the binomial expansion $(x - 2)^8$?
1) $448x^5$
2) $448x^4$
3) $-448x^5$
4) $-448x^4$

80 Solve algebraically for all values of x:
$\log_{(x+4)}(17x - 4) = 2$

81 In $\triangle ABC$, m$\angle A = 120$, $b = 10$, and $c = 18$. What is the area of $\triangle ABC$ to the *nearest square inch*?
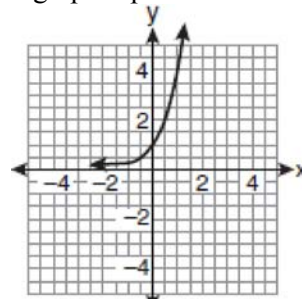1) 52
2) 78
3) 90
4) 156

82 What is the number of degrees in an angle whose measure is 2 radians?
1) $\dfrac{360}{\pi}$
2) $\dfrac{\pi}{360}$
3) 360
4) 90

83 Determine the sum of the first twenty terms of the sequence whose first five terms are 5, 14, 23, 32, 41.

84 If a function is defined by the equation $f(x) = 4^x$, which graph represents the inverse of this function?

1)
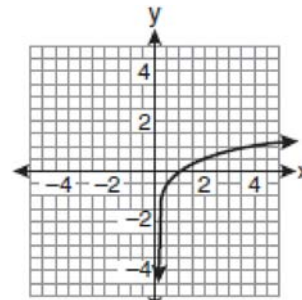
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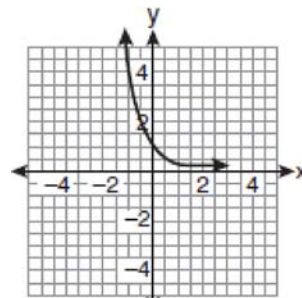
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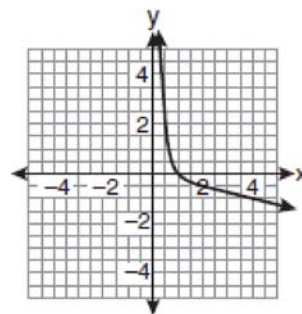
4)

85 Which graph represents the equation $y = \cos^{-1}x$?
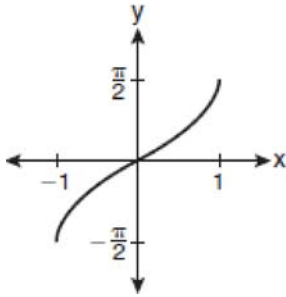
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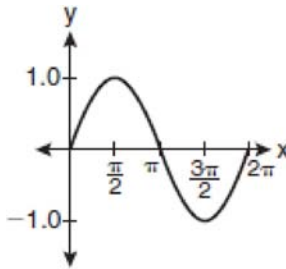
2)
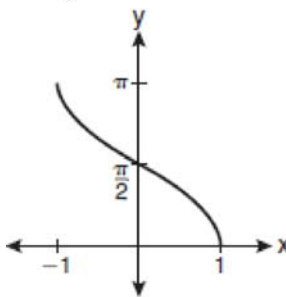
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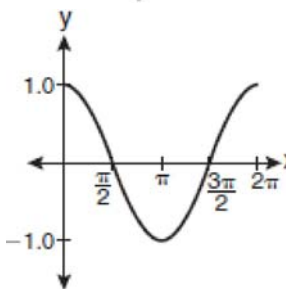
4)

86 If $\log_4 x = 2.5$ and $\log_y 125 = -\dfrac{3}{2}$, find the numerical value of $\dfrac{x}{y}$, in simplest form.

87 The value of $\sin(180 + x)$ is equivalent to
1) $-\sin x$
2) $-\sin(90 - x)$
3) $\sin x$
4) $\sin(90 - x)$

88 In a certain high school, a survey revealed the mean amount of bottled water consumed by students each day was 153 bottles with a standard deviation of 22 bottles. Assuming the survey represented a normal distribution, what is the range of the number of bottled waters that approximately 68.2% of the students drink?
1) $131 - 164$
2) $131 - 175$
3) $142 - 164$
4) $142 - 175$

89 Which ordered pair is a solution of the system of equations shown below? $x + y = 5$
$$(x + 3)^2 + (y - 3)^2 = 53$$
1) $(2, 3)$
2) $(5, 0)$
3) $(-5, 10)$
4) $(-4, 9)$

90 The expression $\log_8 64$ is equivalent to
1) 8
2) 2
3) $\dfrac{1}{2}$
4) $\dfrac{1}{8}$

91 Which function is one-to-one?
1) $f(x) = |x|$
2) $f(x) = 2^x$
3) $f(x) = x^2$
4) $f(x) = \sin x$
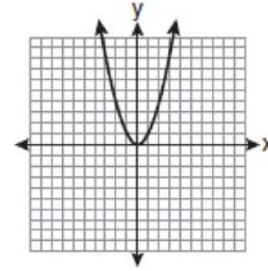
92 Write the binomial expansion of $(2x - 1)^5$ as a polynomial in simplest form.

93 In the diagram below of a unit circle, the ordered pair $\left(-\dfrac{\sqrt{2}}{2}, -\dfrac{\sqrt{2}}{2} \right)$ represents the point where the terminal side of θ intersects the unit circle.
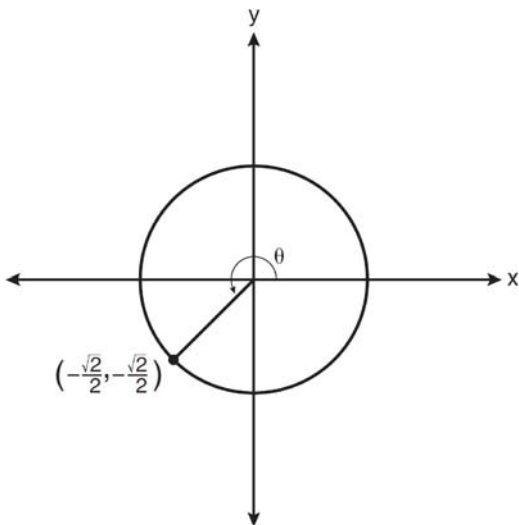
What is $m\angle\theta$?
1) 45
2) 135
3) 225
4) 240

Which graph represents the function $f(x + 2)$?
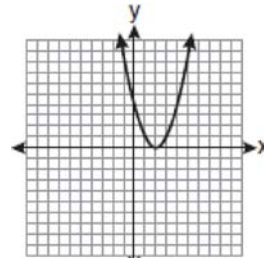
1)
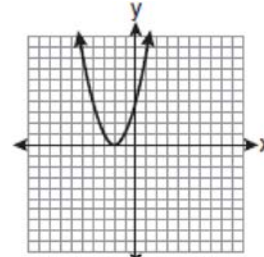
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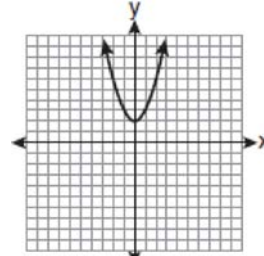
3)
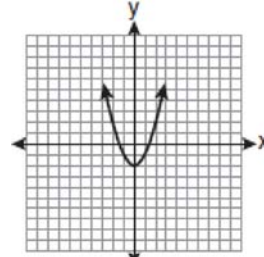
4)

94 The graph below shows the function $f(x)$.

95 The expression $\cos 4x \cos 3x + \sin 4x \sin 3x$ is equivalent to
1) $\sin x$
2) $\sin 7x$
3) $\cos x$
4) $\cos 7x$

96 Determine the solution of the inequality $|3 - 2x| \geq 7$. [The use of the grid below is optional.]
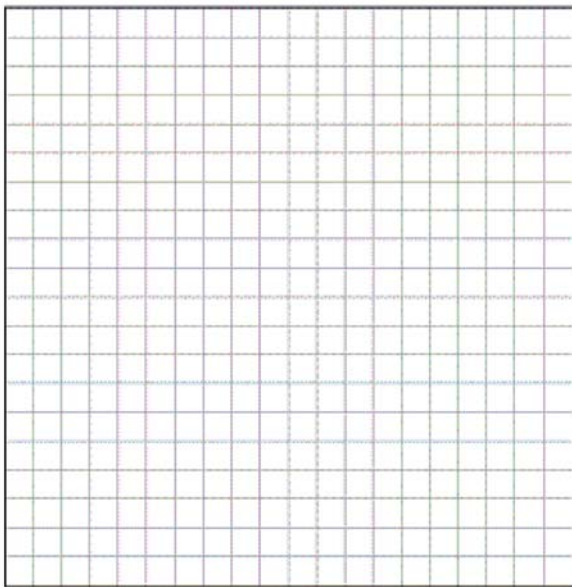
97 The expression $x^{-\frac{2}{5}}$ is equivalent to
1) $-\sqrt[2]{x^5}$
2) $-\sqrt[5]{x^2}$
3) $\dfrac{1}{\sqrt[2]{x^5}}$
4) $\dfrac{1}{\sqrt[5]{x^2}}$

98 The value of the expression $2 \sum\limits_{n=0}^{2}(n^2 + 2^n)$ is
1) 12
2) 22
3) 24
4) 26

99 Which expression, when rounded to three decimal places, is equal to -1.155?
1) $\sec\left(\dfrac{5\pi}{6}\right)$
2) $\tan(49°20')$
3) $\sin\left(-\dfrac{3\pi}{5}\right)$
4) $\csc(-118°)$

100 The table below shows the results of an experiment involving the growth of bacteria.

Time (x) (in minutes)	1	3	5	7	9	11
Number of Bacteria (y)	2	25	81	175	310	497

Write a power regression equation for this set of data, rounding all values to *three decimal places*. Using this equation, predict the bacteria's growth, to the *nearest integer*, after 15 minutes.

101 A committee of 5 members is to be randomly selected from a group of 9 teachers and 20 students. Determine how many different committees can be formed if 2 members must be teachers and 3 members must be students.

15

102 Write an equation of the circle shown in the graph below.
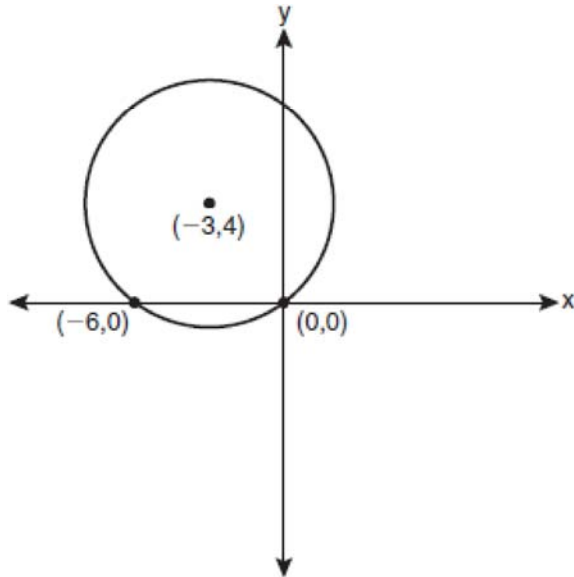
103 Assume that the ages of first-year college students are normally distributed with a mean of 19 years and standard deviation of 1 year. To the *nearest integer*, find the percentage of first-year college students who are between the ages of 18 years and 20 years, inclusive. To the *nearest integer*, find the percentage of first-year college students who are 20 years old or older.

104 Express $\dfrac{5}{3 - \sqrt{2}}$ with a rational denominator, in simplest radical form.

105 The conjugate of $7 - 5i$ is
1) $-7 - 5i$
2) $-7 + 5i$
3) $7 - 5i$
4) $7 + 5i$

106 Matt places $1,200 in an investment account earning an annual rate of 6.5%, compounded continuously. Using the formula $V = Pe^{rt}$, where V is the value of the account in t years, P is the principal initially invested, e is the base of a natural logarithm, and r is the rate of interest, determine the amount of money, to the *nearest cent*, that Matt will have in the account after 10 years.

107 The sum of $\sqrt[3]{6a^4b^2}$ and $\sqrt[3]{162a^4b^2}$, expressed in simplest radical form, is
1) $\sqrt[6]{168a^8b^4}$
2) $2a^2b\sqrt[3]{21a^2b}$
3) $4a\sqrt[3]{6ab^2}$
4) $10a^2b\sqrt[3]{8}$

108 The quantities p and q vary inversely. If $p = 20$ when $q = -2$, and $p = x$ when $q = -2x + 2$, then x equals
1) -4 and 5
2) $\dfrac{20}{19}$
3) -5 and 4
4) $-\dfrac{1}{4}$

16

109 When factored completely, the expression
$3x^3 - 5x^2 - 48x + 80$ is equivalent to
1) $(x^2 - 16)(3x - 5)$
2) $(x^2 + 16)(3x - 5)(3x + 5)$
3) $(x + 4)(x - 4)(3x - 5)$
4) $(x + 4)(x - 4)(3x - 5)(3x - 5)$

110 Which formula can be used to determine the total
number of different eight-letter arrangements that
can be formed using the letters in the word
DEADLINE?
1) $8!$
2) $\dfrac{8!}{4!}$
3) $\dfrac{8!}{2! + 2!}$
4) $\dfrac{8!}{2! \cdot 2!}$

111 When $x^2 + 3x - 4$ is subtracted from $x^3 + 3x^2 - 2x$,
the difference is
1) $x^3 + 2x^2 - 5x + 4$
2) $x^3 + 2x^2 + x - 4$
3) $-x^3 + 4x^2 + x - 4$
4) $-x^3 - 2x^2 + 5x + 4$

112 Solve for x: $\dfrac{4x}{x-3} = 2 + \dfrac{12}{x-3}$

113 What is the equation of the graph shown
below?
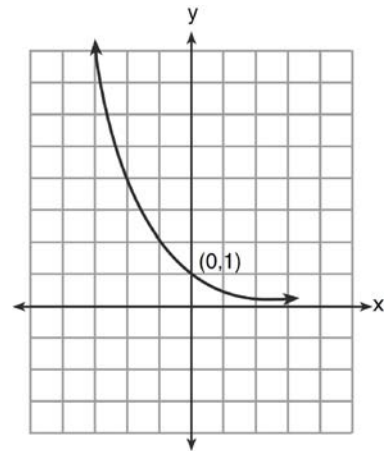
1) $y = 2^x$
2) $y = 2^{-x}$
3) $x = 2^y$
4) $x = 2^{-y}$

114 Expressed in simplest form, $\dfrac{3y}{2y-6} + \dfrac{9}{6-2y}$ is
equivalent to
1) $\dfrac{-6y^2 + 36y - 54}{(2y-6)(6-2y)}$
2) $\dfrac{3y-9}{2y-6}$
3) $\dfrac{3}{2}$
4) $-\dfrac{3}{2}$

115 Which value of k satisfies the equation
$8^{3k+4} = 4^{2k-1}$?
1) -1
2) $-\dfrac{9}{4}$
3) -2
4) $-\dfrac{14}{5}$

116 The equation $y - 2\sin\theta = 3$ may be rewritten as
1) $f(y) = 2\sin x + 3$
2) $f(y) = 2\sin\theta + 3$
3) $f(x) = 2\sin\theta + 3$
4) $f(\theta) = 2\sin\theta + 3$

117 The data collected by a biologist showing the growth of a colony of bacteria at the end of each hour are displayed in the table below.

Time, hour, (x)	Population (y)
0	250
1	330
2	580
3	800
4	1650
5	3000

Write an exponential regression equation to model these data. Round all values to the *nearest thousandth*. Assuming this trend continues, use this equation to estimate, to the nearest *ten*, the number of bacteria in the colony at the end of 7 hours.

118 Solve the equation $8x^3 + 4x^2 - 18x - 9 = 0$ algebraically for all values of x.

119 Solve algebraically for x: $16^{2x+3} = 64^{x+2}$

120 A survey completed at a large university asked 2,000 students to estimate the average number of hours they spend studying each week. Every tenth student entering the library was surveyed. The data showed that the mean number of hours that students spend studying was 15.7 per week. Which characteristic of the survey could create a bias in the results?
1) the size of the sample
2) the size of the population
3) the method of analyzing the data
4) the method of choosing the students who were surveyed

121 A spinner is divided into eight equal sections. Five sections are red and three are green. If the spinner is spun three times, what is the probability that it lands on red *exactly* twice?
1) $\dfrac{25}{64}$
2) $\dfrac{45}{512}$
3) $\dfrac{75}{512}$
4) $\dfrac{225}{512}$

122 Solve the equation $6x^2 - 2x - 3 = 0$ and express the answer in simplest radical form.

123 If θ is an angle in standard position and its terminal side passes through the point $(-3, 2)$, find the exact value of $\csc\theta$.

124 Which calculator output shows the strongest linear relationship between x and y?

1)   Lin Reg
    $y = a + bx$
    $a = 59.026$
    $b = 6.767$
    $r = .8643$

2)   Lin Reg
    $y = a + bx$
    $a = .7$
    $b = 24.2$
    $r = .8361$

3)   Lin Reg
    $y = a + bx$
    $a = 2.45$
    $b = .95$
    $r = .6022$

4)   Lin Reg
    $y = a + bx$
    $a = -2.9$
    $b = 24.1$
    $r = -.8924$

125 Which task is *not* a component of an observational study?
1) The researcher decides who will make up the sample.
2) The researcher analyzes the data received from the sample.
3) The researcher gathers data from the sample, using surveys or taking measurements.
4) The researcher divides the sample into two groups, with one group acting as a control group.

126 What is the range of $f(x) = |x - 3| + 2$?
1) $\{x|x \geq 3\}$
2) $\{y|y \geq 2\}$
3) $\{x|x \in \text{real numbers}\}$
4) $\{y|y \in \text{real numbers}\}$

127 When $x^{-1} + 1$ is divided by $x + 1$, the quotient equals
1) 1
2) $\dfrac{1}{x}$
3) x
4) $-\dfrac{1}{x}$

128 Which equation is represented by the graph below?
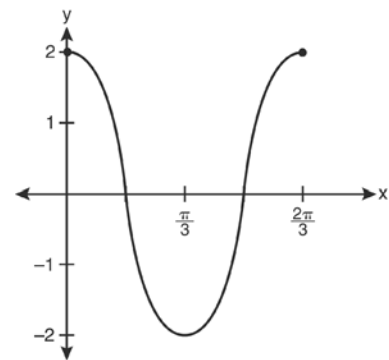
1) $y = 2\cos 3x$
2) $y = 2\sin 3x$
3) $y = 2\cos\dfrac{2\pi}{3}x$
4) $y = 2\sin\dfrac{2\pi}{3}x$

129 What is the conjugate of $\dfrac{1}{2} + \dfrac{3}{2}i$?
1) $-\dfrac{1}{2} + \dfrac{3}{2}i$
2) $\dfrac{1}{2} - \dfrac{3}{2}i$
3) $\dfrac{3}{2} + \dfrac{1}{2}i$
4) $-\dfrac{1}{2} - \dfrac{3}{2}i$

130 What is the solution set of the equation $3x^5 - 48x = 0$?
1) $\{0, \pm 2\}$
2) $\{0, \pm 2, 3\}$
3) $\{0, \pm 2, \pm 2i\}$
4) $\{\pm 2, \pm 2i\}$

131 Find the first four terms of the recursive sequence defined below.
$$a_1 = -3$$
$$a_n = a_{(n-1)} - n$$

132 Which graph does *not* represent a function?
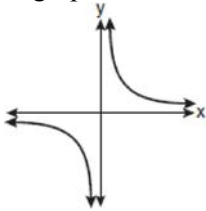
1)
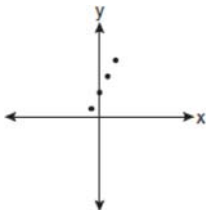
2)
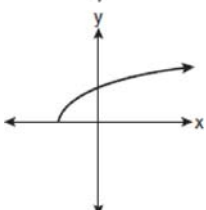
3)
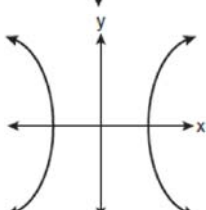
4)

133 Which equation represents the circle shown in the graph below that passes through the point $(0, -1)$?
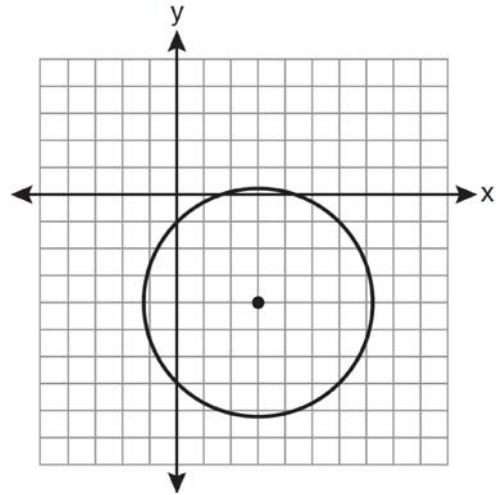
1) $(x - 3)^2 + (y + 4)^2 = 16$
2) $(x - 3)^2 + (y + 4)^2 = 18$
3) $(x + 3)^2 + (y - 4)^2 = 16$
4) $(x + 3)^2 + (y - 4)^2 = 18$

134 The area of triangle ABC is 42. If $AB = 8$ and $m\angle B = 61$, the length of $\overline{BC}$ is approximately
1) 5.1
2) 9.2
3) 12.0
4) 21.7

135 Solve algebraically for x: $4 - \sqrt{2x - 5} = 1$

20

136 Two forces of 25 newtons and 85 newtons acting on a body form an angle of 55°. Find the magnitude of the resultant force, to the *nearest hundredth of a newton*. Find the measure, to the *nearest degree*, of the angle formed between the resultant and the larger force.

137 What is the sum of the first 19 terms of the sequence $3, 10, 17, 24, 31, \ldots$?
1) 1188
2) 1197
3) 1254
4) 1292

138 The expression $4ab\sqrt{2b} - 3a\sqrt{18b^3} + 7ab\sqrt{6b}$ is equivalent to
1) $2ab\sqrt{6b}$
2) $16ab\sqrt{2b}$
3) $-5ab + 7ab\sqrt{6b}$
4) $-5ab\sqrt{2b} + 7ab\sqrt{6b}$

139 In $\triangle ABC$, m$\angle A = 32$, $a = 12$, and $b = 10$. Find the measures of the missing angles and side of $\triangle ABC$. Round each measure to the *nearest tenth*.

140 If $f(x) = \sqrt{9 - x^2}$, what are its domain and range?
1) domain: $\{x \mid -3 \leq x \leq 3\}$; range: $\{y \mid 0 \leq y \leq 3\}$
2) domain: $\{x \mid x \neq \pm 3\}$; range: $\{y \mid 0 \leq y \leq 3\}$
3) domain: $\{x \mid x \leq -3 \text{ or } x \geq 3\}$; range: $\{y \mid y \neq 0\}$
4) domain: $\{x \mid x \neq 3\}$; range: $\{y \mid y \geq 0\}$

141 If $\sin A = \dfrac{1}{3}$, what is the value of $\cos 2A$?
1) $-\dfrac{2}{3}$
2) $\dfrac{2}{3}$
3) $-\dfrac{7}{9}$
4) $\dfrac{7}{9}$

142 In the interval $0° \leq x < 360°$, $\tan x$ is undefined when x equals
1) 0° and 90°
2) 90° and 180°
3) 180° and 270°
4) 90° and 270°

143 Perform the indicated operations and simplify completely:
$$\frac{x^3 - 3x^2 + 6x - 18}{x^2 - 4x} \cdot \frac{2x - 4}{x^4 - 3x^3} \div \frac{x^2 + 2x - 8}{16 - x^2}$$

144 Given angle A in Quadrant I with $\sin A = \dfrac{12}{13}$ and angle B in Quadrant II with $\cos B = -\dfrac{3}{5}$, what is the value of $\cos(A - B)$?
1) $\dfrac{33}{65}$
2) $-\dfrac{33}{65}$
3) $\dfrac{63}{65}$
4) $-\dfrac{63}{65}$

21

145 On January 1, a share of a certain stock cost $180. Each month thereafter, the cost of a share of this stock decreased by one-third. If x represents the time, in months, and y represents the cost of the stock, in dollars, which graph best represents the cost of a share over the following 5 months?

1)

2)

3)

4)
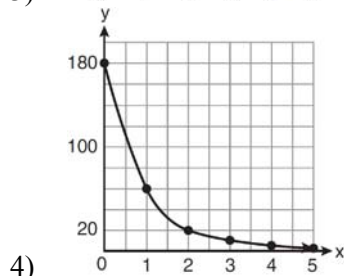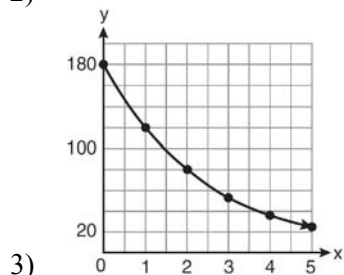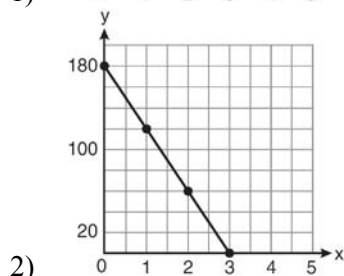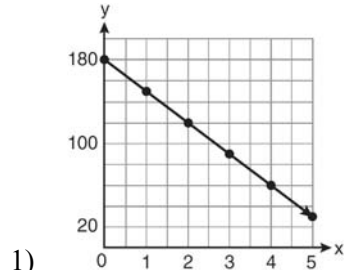
146 Starting with $\sin^2 A + \cos^2 A = 1$, derive the formula $\tan^2 A + 1 = \sec^2 A$.

147 The table below shows the first-quarter averages for Mr. Harper's statistics class.

Statistics Class Averages

Quarter Averages	Frequency
99	1
97	5
95	4
92	4
90	7
87	2
84	6
81	2
75	1
70	2
65	1

What is the population variance for this set of data?
1) 8.2
2) 8.3
3) 67.3
4) 69.3

148 The expression $\log_5\left(\dfrac{1}{25}\right)$ is equivalent to

1) $\dfrac{1}{2}$
2) 2
3) $-\dfrac{1}{2}$
4) -2

149 Evaluate: $10 + \displaystyle\sum_{n=1}^{5}(n^3 - 1)$

22

150 The relationship between t, a student's test scores, and d, the student's success in college, is modeled by the equation $d = 0.48t + 75.2$. Based on this linear regression model, the correlation coefficient could be
1) between -1 and 0
2) between 0 and 1
3) equal to -1
4) equal to 0

151 Factored completely, the expression $6x - x^3 - x^2$ is equivalent to
1) $x(x + 3)(x - 2)$
2) $x(x - 3)(x + 2)$
3) $-x(x - 3)(x + 2)$
4) $-x(x + 3)(x - 2)$

152 If $f(x) = \frac{1}{2}x - 3$ and $g(x) = 2x + 5$, what is the value of $(g \circ f)(4)$?
1) -13
2) 3.5
3) 3
4) 6

153 For which equation does the sum of the roots equal $\frac{3}{4}$ and the product of the roots equal -2?
1) $4x^2 - 8x + 3 = 0$
2) $4x^2 + 8x + 3 = 0$
3) $4x^2 - 3x - 8 = 0$
4) $4x^2 + 3x - 2 = 0$

154 If $f(x) = x^2 - 5$ and $g(x) = 6x$, then $g(f(x))$ is equal to
1) $6x^3 - 30x$
2) $6x^2 - 30$
3) $36x^2 - 5$
4) $x^2 + 6x - 5$

155 Which equation is sketched in the diagram below?
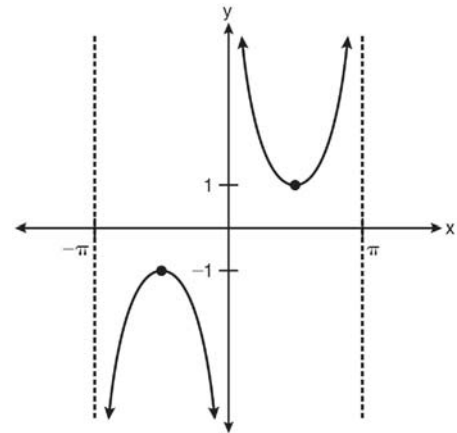
1) $y = \csc x$
2) $y = \sec x$
3) $y = \cot x$
4) $y = \tan x$

156 The discriminant of a quadratic equation is 24. The roots are
1) imaginary
2) real, rational, and equal
3) real, rational, and unequal
4) real, irrational, and unequal

23

Algebra 2/Trigonometry Regents at Random

157 Express $\dfrac{\cot x \sin x}{\sec x}$ as a single trigonometric function, in simplest form, for all values of x for which it is defined.

158 The points $(2,3)$, $\left(4, \dfrac{3}{4}\right)$, and $(6,d)$ lie on the graph of a function. If y is inversely proportional to the square of x, what is the value of d?
1) 1
2) $\dfrac{1}{3}$
3) 3
4) 27

159 What is the number of degrees in an angle whose radian measure is $\dfrac{11\pi}{12}$?
1) 150
2) 165
3) 330
4) 518

160 Which expression is equivalent to $\dfrac{x^{-1}y^4}{3x^{-5}y^{-1}}$?
1) $\dfrac{x^4 y^5}{3}$
2) $\dfrac{x^5 y^4}{3}$
3) $3x^4 y^5$
4) $\dfrac{y^4}{3x^5}$

161 Which graph best represents the inequality $y + 6 \geq x^2 - x$?

1)

2)

3)

4)
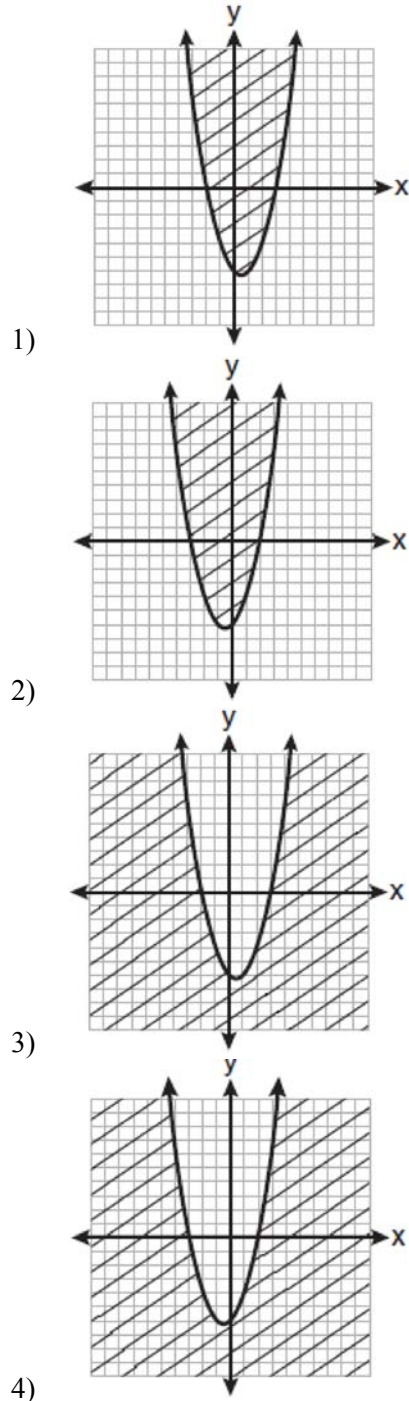
162 Find the third term in the recursive sequence $a_{k+1} = 2a_k - 1$, where $a_1 = 3$.

163 Express the product of cos 30° and sin 45° in simplest radical form.

164 A circle is drawn to represent a pizza with a 12 inch diameter. The circle is cut into eight congruent pieces. What is the length of the outer edge of any one piece of this circle?
1) $\dfrac{3\pi}{4}$
2) π
3) $\dfrac{3\pi}{2}$
4) 3π

165 What is the solution set for the equation $\sqrt{5x+29} = x+3$?
1) $\{4\}$
2) $\{-5\}$
3) $\{4,5\}$
4) $\{-5,4\}$

166 The expression $\dfrac{\sin^2\theta + \cos^2\theta}{1-\sin^2\theta}$ is equivalent to
1) $\cos^2\theta$
2) $\sin^2\theta$
3) $\sec^2\theta$
4) $\csc^2\theta$

167 If $m\angle\theta = -50$, which diagram represents θ drawn in standard position?
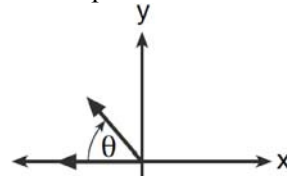
1)
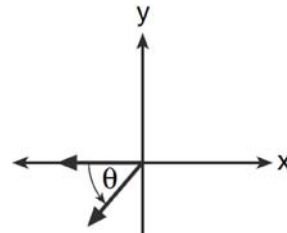
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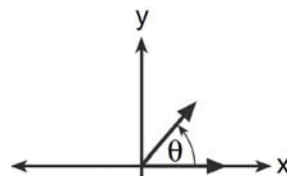
3)
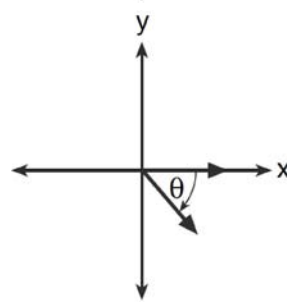
4)

168 The solution set of the equation $\sqrt{x+3} = 3-x$ is
1) $\{1\}$
2) $\{0\}$
3) $\{1,6\}$
4) $\{2,3\}$

169 In the right triangle shown below, what is the measure of angle S, to the *nearest minute*?
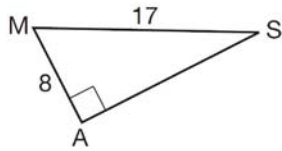
1) 28°1'
2) 28°4'
3) 61°56'
4) 61°93'

170 Expressed with a rational denominator and in simplest form, $\dfrac{x}{x - \sqrt{x}}$ is

1) $\dfrac{x^2 + x\sqrt{x}}{x^2 - x}$

2) $-\sqrt{x}$

3) $\dfrac{x + \sqrt{x}}{1 - x}$

4) $\dfrac{x + \sqrt{x}}{x - 1}$

171 If $\angle A$ is acute and $\tan A = \dfrac{2}{3}$, then

1) $\cot A = \dfrac{2}{3}$

2) $\cot A = \dfrac{1}{3}$

3) $\cot(90° - A) = \dfrac{2}{3}$

4) $\cot(90° - A) = \dfrac{1}{3}$

172 An auditorium has 21 rows of seats. The first row has 18 seats, and each succeeding row has two more seats than the previous row. How many seats are in the auditorium?
1) 540
2) 567
3) 760
4) 798

173 Express as a single fraction the exact value of $\sin 75°$.

174 The measures of the angles between the resultant and two applied forces are 60° and 45°, and the magnitude of the resultant is 27 pounds. Find, to the *nearest pound*, the magnitude of each applied force.

175 Solve algebraically for x: $\log_{27}(2x - 1) = \dfrac{4}{3}$

176 In simplest form, $\sqrt{-300}$ is equivalent to
1) $3i\sqrt{10}$
2) $5i\sqrt{12}$
3) $10i\sqrt{3}$
4) $12i\sqrt{5}$

177 If $a = 3$ and $b = -2$, what is the value of the expression $\dfrac{a^{-2}}{b^{-3}}$?

1) $-\dfrac{9}{8}$

2) -1

3) $-\dfrac{8}{9}$

4) $\dfrac{8}{9}$

178 The function $f(x) = \tan x$ is defined in such a way that $f^{-1}(x)$ is a function. What can be the domain of $f(x)$?

1) $\{x | 0 \leq x \leq \pi\}$

2) $\{x | 0 \leq x \leq 2\pi\}$

3) $\left\{ x \middle| -\dfrac{\pi}{2} < x < \dfrac{\pi}{2} \right\}$

4) $\left\{ x \middle| -\dfrac{\pi}{2} < x < \dfrac{3\pi}{2} \right\}$

179 A cup of soup is left on a countertop to cool. The table below gives the temperatures, in degrees Fahrenheit, of the soup recorded over a 10-minute period.

Time in Minutes (x)	Temperature in $^{\circ}$F (y)
0	180.2
2	165.8
4	146.3
6	135.4
8	127.7
10	110.5

Write an exponential regression equation for the data, rounding all values to the *nearest thousandth*.

180 What is the domain of the function shown below?
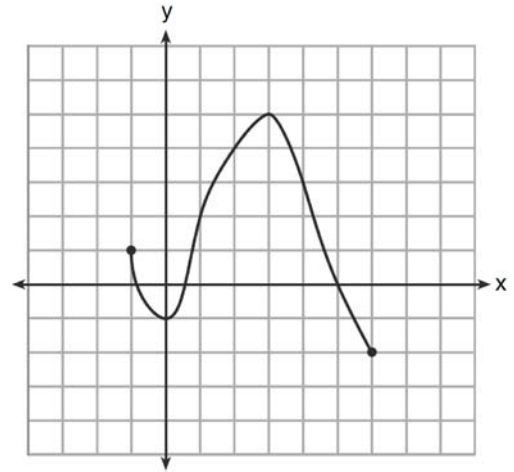
1) $-1 \leq x \leq 6$

2) $-1 \leq y \leq 6$

3) $-2 \leq x \leq 5$

4) $-2 \leq y \leq 5$

181 What is the graph of the solution set of $|2x - 1| > 5$?

182 The solution set of $\sqrt{3x + 16} = x + 2$ is

1) $\{-3, 4\}$

2) $\{-4, 3\}$

3) $\{3\}$

4) $\{-4\}$

183 Find the number of possible different 10-letter arrangements using the letters of the word "STATISTICS."

184 Express the product of $\left(\dfrac{1}{2}y^2 - \dfrac{1}{3}y \right)$ and

$\left(12y + \dfrac{3}{5} \right)$ as a trinomial.

185 The letters of any word can be rearranged. Carol believes that the number of different 9-letter arrangements of the word "TENNESSEE" is greater than the number of different 7-letter arrangements of the word "VERMONT." Is she correct? Justify your answer.

186 Mrs. Hill asked her students to express the sum $1 + 3 + 5 + 7 + 9 + \ldots + 39$ using sigma notation. Four different student answers were given. Which student answer is correct?

1) $\displaystyle\sum_{k=1}^{20}(2k-1)$

2) $\displaystyle\sum_{k=2}^{40}(k-1)$

3) $\displaystyle\sum_{k=-1}^{37}(k+2)$

4) $\displaystyle\sum_{k=1}^{39}(2k-1)$

187 What is the range of the function shown below?
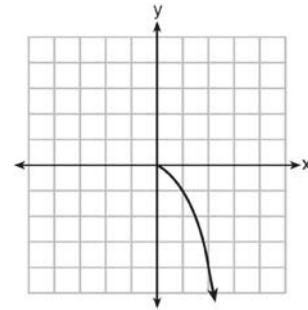
1) $x \le 0$
2) $x \ge 0$
3) $y \le 0$
4) $y \ge 0$

188 Write an equation for the graph of the trigonometric function shown below.
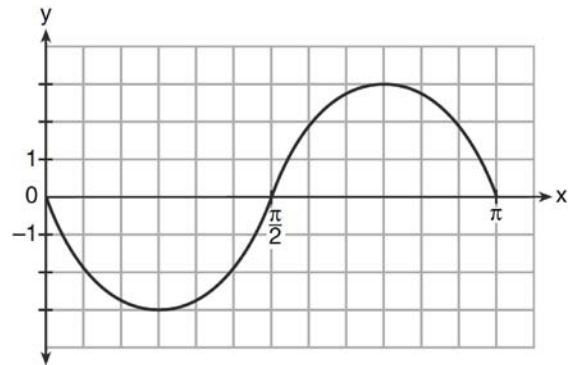
189 In which interval of $f(x) = \cos(x)$ is the inverse also a function?

1) $-\dfrac{\pi}{2} < x < \dfrac{\pi}{2}$

2) $-\dfrac{\pi}{2} \le x \le \dfrac{\pi}{2}$

3) $0 \le x \le \pi$

4) $\dfrac{\pi}{2} \le x \le \dfrac{3\pi}{2}$

28

190 On the unit circle shown in the diagram below, sketch an angle, in standard position, whose degree measure is 240 and find the exact value of $\sin 240°$.
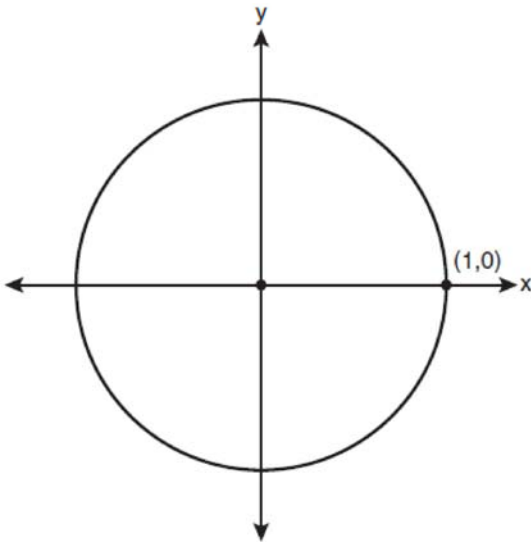
191 Which relation is *not* a function?
1) $(x-2)^2 + y^2 = 4$
2) $x^2 + 4x + y = 4$
3) $x + y = 4$
4) $xy = 4$

192 The expression $\cos^2 \theta - \cos 2\theta$ is equivalent to
1) $\sin^2 \theta$
2) $-\sin^2 \theta$
3) $\cos^2 \theta + 1$
4) $-\cos^2 \theta - 1$

193 If $g(x) = \left(ax\sqrt{1-x} \right)^2$, express g(10) in simplest form.

194 What is the formula for the nth term of the sequence $54, 18, 6, \ldots$?
1) $a_n = 6\left(\dfrac{1}{3} \right)^n$
2) $a_n = 6\left(\dfrac{1}{3} \right)^{n-1}$
3) $a_n = 54\left(\dfrac{1}{3} \right)^n$
4) $a_n = 54\left(\dfrac{1}{3} \right)^{n-1}$

195 If n is a negative integer, then which statement is always true?
1) $6n^{-2} < 4n^{-1}$
2) $\dfrac{n}{4} > -6n^{-1}$
3) $6n^{-1} < 4n^{-1}$
4) $4n^{-1} > (6n)^{-1}$

196 What is the value of x in the equation $\log_5 x = 4$?
1) 1.16
2) 20
3) 625
4) 1,024

197 What is a positive value of $\tan \dfrac{1}{2}x$, when $\sin x = 0.8$?
1) 0.5
2) 0.4
3) 0.33
4) 0.25

29

198 What is the principal value of $\cos^{-1}\left(-\dfrac{\sqrt{3}}{2}\right)$?

    1) $-30°$
    2) $60°$
    3) $150°$
    4) $240°$

199 Find the sum and product of the roots of the equation $5x^2 + 11x - 3 = 0$.

200 Evaluate $e^{x\ln y}$ when $x = 3$ and $y = 2$.

201 The equation $x^2 + y^2 - 2x + 6y + 3 = 0$ is equivalent to
    1) $(x-1)^2 + (y+3)^2 = -3$
    2) $(x-1)^2 + (y+3)^2 = 7$
    3) $(x+1)^2 + (y+3)^2 = 7$
    4) $(x+1)^2 + (y+3)^2 = 10$

202 Which two functions are inverse functions of each other?
    1) $f(x) = \sin x$ and $g(x) = \cos(x)$
    2) $f(x) = 3 + 8x$ and $g(x) = 3 - 8x$
    3) $f(x) = e^x$ and $g(x) = \ln x$
    4) $f(x) = 2x - 4$ and $g(x) = -\dfrac{1}{2}x + 4$

203 Which graph shows $y = \cos^{-1} x$?
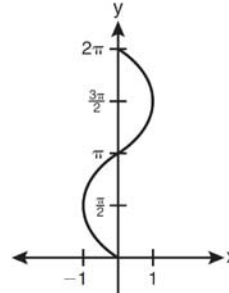
1)
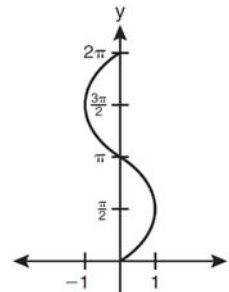
2)
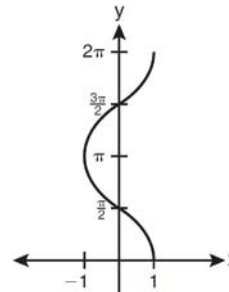
3)
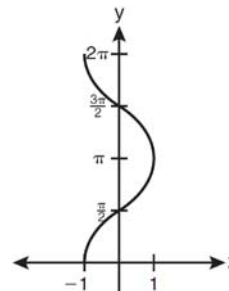
4)

204 The expression $2\log x - (3\log y + \log z)$ is equivalent to

1) $\log \dfrac{x^2}{y^3 z}$

2) $\log \dfrac{x^2 z}{y^3}$

3) $\log \dfrac{2x}{3yz}$

4) $\log \dfrac{2xz}{3y}$

205 Which equation represents the graph below?
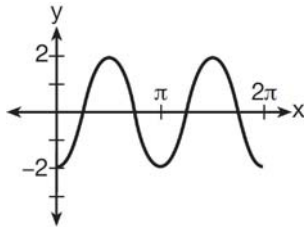
1) $y = -2\sin 2x$

2) $y = -2\sin \dfrac{1}{2}x$

3) $y = -2\cos 2x$

4) $y = -2\cos \dfrac{1}{2}x$

206 In $\triangle ABC$, $m\angle A = 74$, $a = 59.2$, and $c = 60.3$. What are the two possible values for $m\angle C$, to the *nearest tenth*?
1) 73.7 and 106.3
2) 73.7 and 163.7
3) 78.3 and 101.7
4) 78.3 and 168.3

207 The table below shows the number of new stores in a coffee shop chain that opened during the years 1986 through 1994.

Year	Number of New Stores
1986	14
1987	27
1988	48
1989	80
1990	110
1991	153
1992	261
1993	403
1994	681

Using $x = 1$ to represent the year 1986 and y to represent the number of new stores, write the exponential regression equation for these data. Round all values to the *nearest thousandth*.

208 If $\tan A = \dfrac{2}{3}$ and $\sin B = \dfrac{5}{\sqrt{41}}$ and angles A and B are in Quadrant I, find the value of $\tan(A + B)$.

209 The roots of the equation $9x^2 + 3x - 4 = 0$ are
1) imaginary
2) real, rational, and equal
3) real, rational, and unequal
4) real, irrational, and unequal

210 What is the common ratio of the geometric sequence whose first term is 27 and fourth term is 64?

1) $\frac{3}{4}$

2) $\frac{64}{81}$

3) $\frac{4}{3}$

4) $\frac{37}{3}$

211 The two sides and included angle of a parallelogram are 18, 22, and 60°. Find its exact area in simplest form.

212 The sides of a parallelogram measure 10 cm and 18 cm. One angle of the parallelogram measures 46 degrees. What is the area of the parallelogram, to the *nearest square centimeter*?

1) 65
2) 125
3) 129
4) 162

213 Which expression is equivalent to $\frac{\sqrt{3}+5}{\sqrt{3}-5}$?

1) $-\frac{14+5\sqrt{3}}{11}$

2) $-\frac{17+5\sqrt{3}}{11}$

3) $\frac{14+5\sqrt{3}}{14}$

4) $\frac{17+5\sqrt{3}}{14}$

214 Which summation represents $5+7+9+11+\ldots+43$?

1) $\sum\limits_{n=5}^{43} n$

2) $\sum\limits_{n=1}^{20} (2n+3)$

3) $\sum\limits_{n=4}^{24} (2n-3)$

4) $\sum\limits_{n=3}^{23} (3n-4)$

215 Which diagram represents a relation that is both one-to-one and onto?

1)

2)

3)

4)
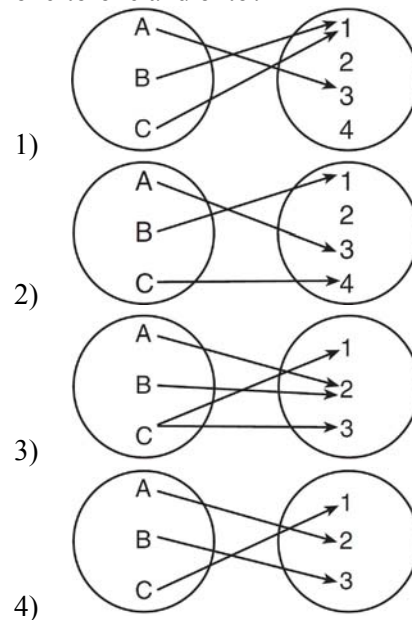
216 Express $5\sqrt{3x^3} - 2\sqrt{27x^3}$ in simplest radical form.

32

217 Which problem involves evaluating $_6P_4$?

   1) How many different four-digit ID numbers can be formed using 1, 2, 3, 4, 5, and 6 without repetition?

   2) How many different subcommittees of four can be chosen from a committee having six members?

   3) How many different outfits can be made using six shirts and four pairs of pants?

   4) How many different ways can one boy and one girl be selected from a group of four boys and six girls?

218 What is the common ratio of the sequence
$$\frac{1}{64} a^5 b^3, -\frac{3}{32} a^3 b^4, \frac{9}{16} ab^5, \ldots?$$

   1) $-\dfrac{3b}{2a^2}$

   2) $-\dfrac{6b}{a^2}$

   3) $-\dfrac{3a^2}{b}$

   4) $-\dfrac{6a^2}{b}$

219 Howard collected fish eggs from a pond behind his house so he could determine whether sunlight had an effect on how many of the eggs hatched. After he collected the eggs, he divided them into two tanks. He put both tanks outside near the pond, and he covered one of the tanks with a box to block out all sunlight. State whether Howard's investigation was an example of a controlled experiment, an observation, or a survey. Justify your response.

220 Which graph represents a one-to-one function?
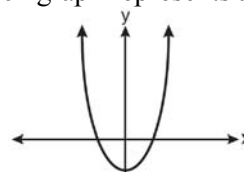
   1)
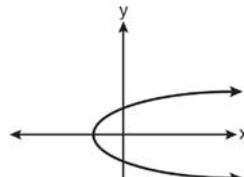
   2)
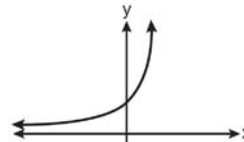
   3)
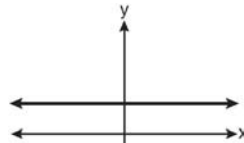
   4)

221 How many negative solutions to the equation $2x^3 - 4x^2 + 3x - 1 = 0$ exist?

   1) 1

   2) 2

   3) 3

   4) 0

222 What is the coefficient of the fourth term in the expansion of $(a - 4b)^9$?
1) $-5,376$
2) -336
3) 336
4) $5,376$

223 If $r = \sqrt[3]{\dfrac{A^2 B}{C}}$, then $\log r$ can be represented by

1) $\dfrac{1}{6} \log A + \dfrac{1}{3} \log B - \log C$

2) $3(\log A^2 + \log B - \log C)$

3) $\dfrac{1}{3} \log(A^2 + B) - C$

4) $\dfrac{2}{3} \log A + \dfrac{1}{3} \log B - \dfrac{1}{3} \log C$

224 When $x^{-1} - 1$ is divided by $x - 1$, the quotient is
1) -1

2) $-\dfrac{1}{x}$

3) $\dfrac{1}{x^2}$

4) $\dfrac{1}{(x-1)^2}$

225 A ranch in the Australian Outback is shaped like triangle ACE, with $m\angle A = 42$, $m\angle E = 103$, and $AC = 15$ miles. Find the area of the ranch, to the *nearest square mile*.

226 Simplify the expression $\dfrac{3x^{-4}y^5}{(2x^3 y^{-7})^{-2}}$ and write the answer using only positive exponents.

227 A circle shown in the diagram below has a center of $(-5, 3)$ and passes through point $(-1, 7)$.
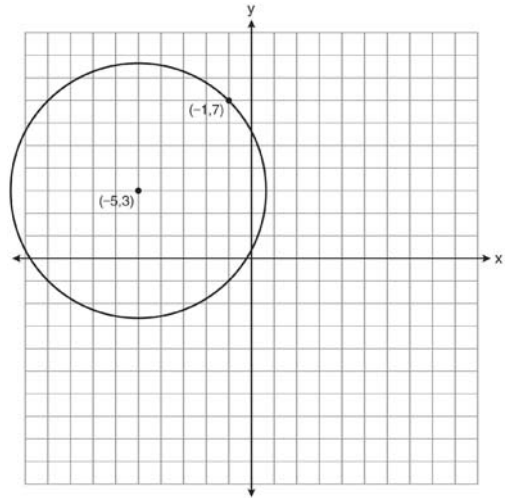
Write an equation that represents the circle.

228 If $\log_b x = 3 \log_b p - \left(2 \log_b t + \dfrac{1}{2} \log_b r \right)$, then the value of x is

1) $\dfrac{p^3}{\sqrt{t^2 r}}$

2) $p^3 t^2 r^{\frac{1}{2}}$

3) $\dfrac{p^3 t^2}{\sqrt{r}}$

4) $\dfrac{p^3}{t^2 \sqrt{r}}$

229 The value of the expression $\sum_{r=3}^{5}(-r^2 + r)$ is

1) −38
2) −12
3) 26
4) 62

230 Determine the sum and the product of the roots of the equation $12x^2 + x - 6 = 0$.

231 What is the fifteenth term of the geometric sequence $-\sqrt{5}, \sqrt{10}, -2\sqrt{5}, \ldots$?

1) $-128\sqrt{5}$
2) $128\sqrt{10}$
3) $-16384\sqrt{5}$
4) $16384\sqrt{10}$

232 The number of minutes students took to complete a quiz is summarized in the table below.

Minutes	14	15	16	17	18	19	20
Number of Students	5	3	x	5	2	10	1

If the mean number of minutes was 17, which equation could be used to calculate the value of x?

1) $17 = \dfrac{119 + x}{x}$
2) $17 = \dfrac{119 + 16x}{x}$
3) $17 = \dfrac{446 + x}{26 + x}$
4) $17 = \dfrac{446 + 16x}{26 + x}$

233 The expression $(x^2 - 1)^{-\frac{2}{3}}$ is equivalent to

1) $\sqrt[3]{(x^2 - 1)^2}$
2) $\dfrac{1}{\sqrt[3]{(x^2 - 1)^2}}$
3) $\sqrt{(x^2 - 1)^3}$
4) $\dfrac{1}{\sqrt{(x^2 - 1)^3}}$

234 In a study of 82 video game players, the researchers found that the ages of these players were normally distributed, with a mean age of 17 years and a standard deviation of 3 years. Determine if there were 15 video game players in this study over the age of 20. Justify your answer.

235 A doctor wants to test the effectiveness of a new drug on her patients. She separates her sample of patients into two groups and administers the drug to only one of these groups. She then compares the results. Which type of study best describes this situation?

1) census
2) survey
3) observation
4) controlled experiment

236 On a multiple-choice test, Abby randomly guesses on all seven questions. Each question has four choices. Find the probability, to the nearest thousandth, that Abby gets exactly three questions correct.

35

237 Two sides of a parallelogram are 24 feet and 30 feet. The measure of the angle between these sides is 57°. Find the area of the parallelogram, to the *nearest square foot*.

238 In $\triangle MNP$, $m = 6$ and $n = 10$. Two distinct triangles can be constructed if the measure of angle M is
1) 35
2) 40
3) 45
4) 50

239 The probability that a professional baseball player will get a hit is $\frac{1}{3}$. Calculate the exact probability that he will get *at least* 3 hits in 5 attempts.

240 What is the product of $\left(\frac{2}{5}x - \frac{3}{4}y^2 \right)$ and $\left(\frac{2}{5}x + \frac{3}{4}y^2 \right)$?

1) $\frac{4}{25}x^2 - \frac{9}{16}y^4$

2) $\frac{4}{25}x - \frac{9}{16}y^2$

3) $\frac{2}{5}x^2 - \frac{3}{4}y^4$

4) $\frac{4}{5}x$

241 What is the number of degrees in an angle whose radian measure is $\frac{8\pi}{5}$?
1) 576
2) 288
3) 225
4) 113

242 The graph of $y = x^3 - 4x^2 + x + 6$ is shown below.
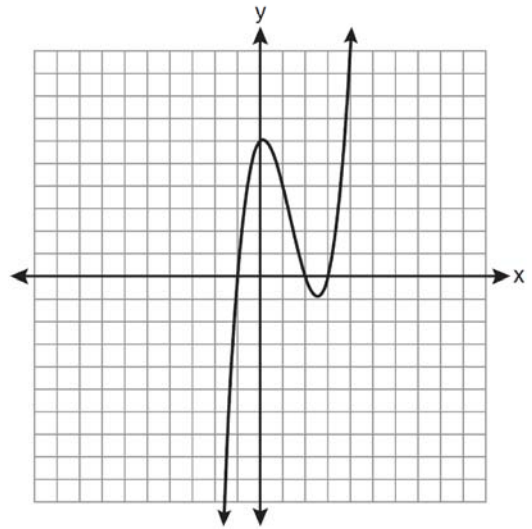
What is the product of the roots of the equation $x^3 - 4x^2 + x + 6 = 0$?
1) −36
2) −6
3) 6
4) 4

243 Which graph represents a relation that is *not* a function?

1)

2)

3)

4)
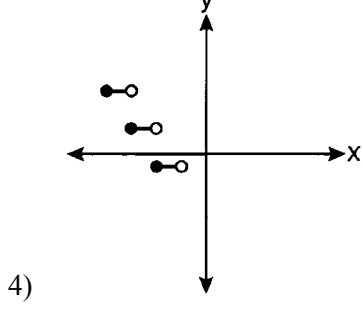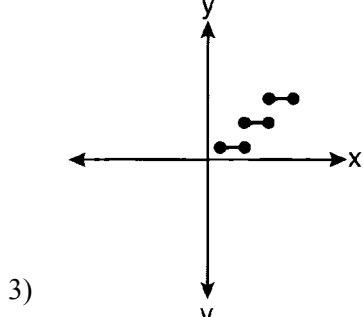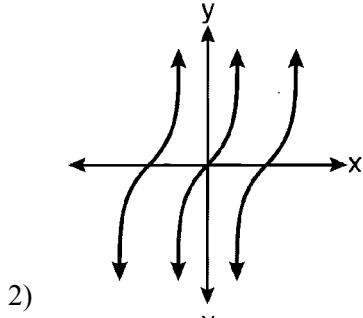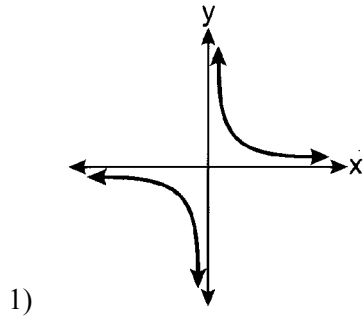
244 Twenty different cameras will be assigned to several boxes. Three cameras will be randomly selected and assigned to box A. Which expression can be used to calculate the number of ways that three cameras can be assigned to box A?
1) 20!
2) $\dfrac{20!}{3!}$
3) $_{20}C_3$
4) $_{20}P_3$

245 The expression $\sin(\theta + 90)°$ is equivalent to
1) $-\sin\theta$
2) $-\cos\theta$
3) $\sin\theta$
4) $\cos\theta$

246 Which function is one-to-one?
1) $k(x) = x^2 + 2$
2) $g(x) = x^3 + 2$
3) $f(x) = |x| + 2$
4) $j(x) = x^4 + 2$

247 The principal would like to assemble a committee of 8 students from the 15-member student council. How many different committees can be chosen?
1) 120
2) 6,435
3) 32,432,400
4) 259,459,200

248 Express the sum $7 + 14 + 21 + 28 + \ldots + 105$ using sigma notation.

249 The formula for continuously compounded interest is $A = Pe^{rt}$, where A is the amount of money in the account, P is the initial investment, r is the interest rate, and t is the time in years. Using the formula, determine, to the *nearest dollar*, the amount in the account after 8 years if $750 is invested at an annual rate of 3%.

250 The expression $\sqrt[4]{16x^2y^7}$ is equivalent to

1) $2x^{\frac{1}{2}}y^{\frac{7}{4}}$
2) $2x^8y^{28}$
3) $4x^{\frac{1}{2}}y^{\frac{7}{4}}$
4) $4x^8y^{28}$

251 In a triangle, two sides that measure 6 cm and 10 cm form an angle that measures 80°. Find, to the *nearest degree*, the measure of the smallest angle in the triangle.

252 Express $\left(\frac{2}{3}x - 1\right)^2$ as a trinomial.

253 Solve the equation below algebraically, and express the result in simplest radical form:
$$\frac{13}{x} = 10 - x$$

254 What is the period of the function $f(\theta) = -2\cos 3\theta$?

1) π
2) $\frac{2\pi}{3}$
3) $\frac{3\pi}{2}$
4) 2π

255 Which values of x are in the solution set of the following system of equations?
$$y = 3x - 6$$
$$y = x^2 - x - 6$$

1) $0, -4$
2) $0, 4$
3) $6, -2$
4) $-6, 2$

256 Which expression is equivalent to $\dfrac{2x^{-2}y^{-2}}{4y^{-5}}$?

1) $\dfrac{y^3}{2x^2}$
2) $\dfrac{2y^3}{x^2}$
3) $\dfrac{2x^2}{y^3}$
4) $\dfrac{x^2}{2y^3}$

257 If $x = 3i$, $y = 2i$, and $z = m + i$, the expression xy^2z equals
1) $-12 - 12mi$
2) $-6 - 6mi$
3) $12 - 12mi$
4) $6 - 6mi$

258 The expression $\dfrac{4}{5 - \sqrt{13}}$ is equivalent to

1) $\dfrac{4\sqrt{13}}{5\sqrt{13} - 13}$

2) $\dfrac{4(5 - \sqrt{13})}{38}$

3) $\dfrac{5 + \sqrt{13}}{3}$

4) $\dfrac{4(5 + \sqrt{13})}{38}$

259 If $\tan\left(\text{Arc}\cos\dfrac{\sqrt{3}}{k}\right) = \dfrac{\sqrt{3}}{3}$, then k is

1) 1
2) 2
3) $\sqrt{2}$
4) $3\sqrt{2}$

260 A market research firm needs to collect data on viewer preferences for local news programming in Buffalo. Which method of data collection is most appropriate?
1) census
2) survey
3) observation
4) controlled experiment

261 The graph of the equation $y = \left(\dfrac{1}{2}\right)^x$ has an asymptote. On the grid below, sketch the graph of $y = \left(\dfrac{1}{2}\right)^x$ and write the equation of this asymptote.
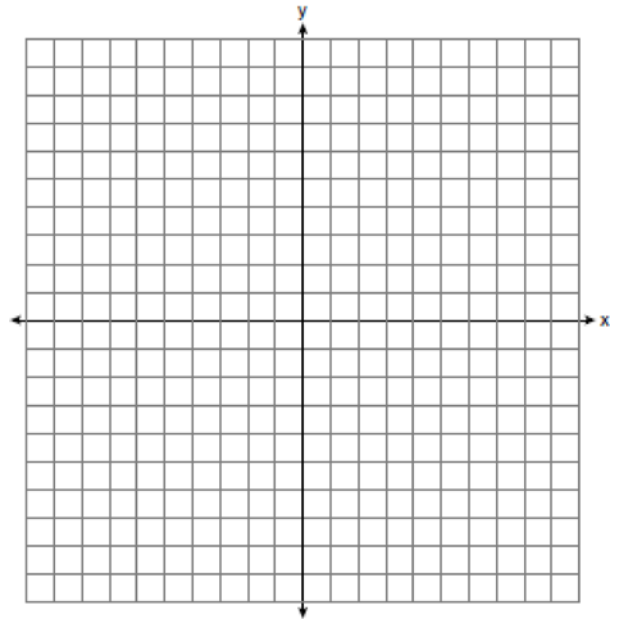
262 The conjugate of the complex expression $-5x + 4i$ is
1) $5x - 4i$
2) $5x + 4i$
3) $-5x - 4i$
4) $-5x + 4i$

263 Use the discriminant to determine all values of k that would result in the equation $x^2 - kx + 4 = 0$ having equal roots.

264 Solve the equation $2\tan C - 3 = 3\tan C - 4$ algebraically for all values of C in the interval $0° \le C < 360°$.

269 Solve algebraically for x: $\log_{x+3} \dfrac{x^3 + x - 2}{x} = 2$

270 Expressed as a function of a positive acute angle, $\cos(-305°)$ is equal to
1) $-\cos 55°$
2) $\cos 55°$
3) $-\sin 55°$
4) $\sin 55°$

265 The product of $(3 + \sqrt{5})$ and $(3 - \sqrt{5})$ is
1) $4 - 6\sqrt{5}$
2) $14 - 6\sqrt{5}$
3) 14
4) 4

266 Which expression is equivalent to $(n \circ m \circ p)(x)$, given $m(x) = \sin x$, $n(x) = 3x$, and $p(x) = x^2$?
1) $\sin(3x)^2$
2) $3\sin x^2$
3) $\sin^2(3x)$
4) $3\sin^2 x$

271 Factor completely: $10ax^2 - 23ax - 5a$

272 Samantha constructs the scatter plot below from a set of data.

267 Factored completely, the expression $12x^4 + 10x^3 - 12x^2$ is equivalent to
1) $x^2(4x + 6)(3x - 2)$
2) $2(2x^2 + 3x)(3x^2 - 2x)$
3) $2x^2(2x - 3)(3x + 2)$
4) $2x^2(2x + 3)(3x - 2)$

268 The minimum point on the graph of the equation $y = f(x)$ is $(-1, -3)$. What is the minimum point on the graph of the equation $y = f(x) + 5$?
1) $(-1, 2)$
2) $(-1, -8)$
3) $(4, -3)$
4) $(-6, -3)$
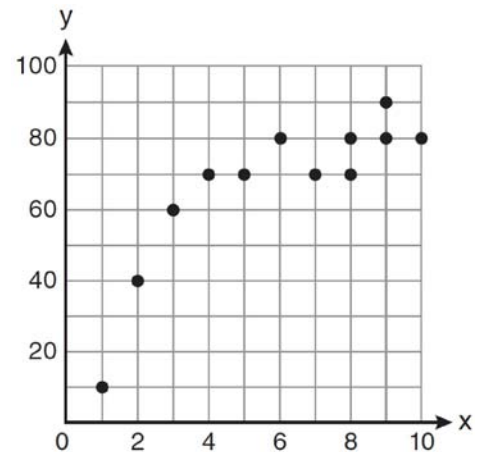
Based on her scatter plot, which regression model would be most appropriate?
1) exponential
2) linear
3) logarithmic
4) power

40

273 Find the total number of different twelve-letter arrangements that can be formed using the letters in the word *PENNSYLVANIA*.

274 What is the value of x in the equation $9^{3x+1} = 27^{x+2}$?
1) 1
2) $\dfrac{1}{3}$
3) $\dfrac{1}{2}$
4) $\dfrac{4}{3}$

275 Find all values of θ in the interval $0° \le \theta < 360°$ that satisfy the equation $\sin 2\theta = \sin \theta$.

276 A study finds that 80% of the local high school students text while doing homework. Ten students are selected at random from the local high school. Which expression would be part of the process used to determine the probability that, *at most*, 7 of the 10 students text while doing homework?
1) $\;_{10}C_6 \left(\dfrac{4}{5} \right)^6 \left(\dfrac{1}{5} \right)^4$
2) $\;_{10}C_7 \left(\dfrac{4}{5} \right)^{10} \left(\dfrac{1}{5} \right)^7$
3) $\;_{10}C_8 \left(\dfrac{7}{10} \right)^{10} \left(\dfrac{3}{10} \right)^2$
4) $\;_{10}C_9 \left(\dfrac{7}{10} \right)^9 \left(\dfrac{3}{10} \right)^1$

277 When simplified, the expression $\left(\dfrac{w^{-5}}{w^{-9}} \right)^{\frac{1}{2}}$ is equivalent to
1) w^{-7}
2) w^2
3) w^7
4) w^{14}

278 What is the conjugate of $-2 + 3i$?
1) $-3 + 2i$
2) $-2 - 3i$
3) $2 - 3i$
4) $3 + 2i$

279 Which ordered pair is in the solution set of the system of equations shown below?
$$y^2 - x^2 + 32 = 0$$
$$3y - x = 0$$
1) $(2, 6)$
2) $(3, 1)$
3) $(-1, -3)$
4) $(-6, -2)$

280 Determine the value of n in simplest form:
$i^{13} + i^{18} + i^{31} + n = 0$

281 Find, to the *nearest tenth*, the radian measure of 216°.

282 Which graph represents the function $\log_2 x = y$?

1)

2)

3)

4)
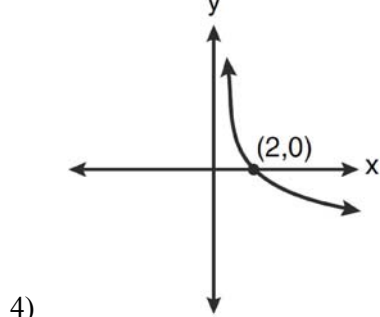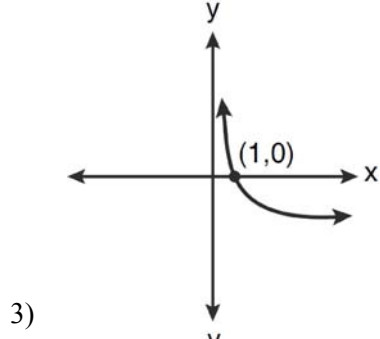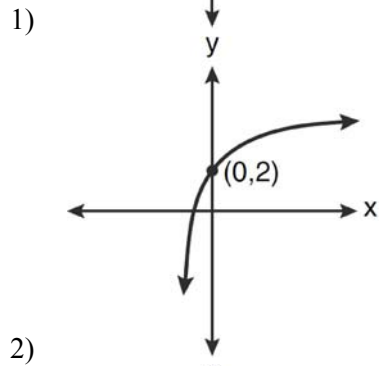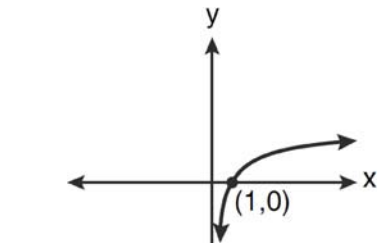
283 When factored completely, $x^3 + 3x^2 - 4x - 12$ equals
1) $(x+2)(x-2)(x-3)$
2) $(x+2)(x-2)(x+3)$
3) $(x^2 - 4)(x+3)$
4) $(x^2 - 4)(x-3)$

284 Susie invests $500 in an account that is compounded continuously at an annual interest rate of 5%, according to the formula $A = Pe^{rt}$, where A is the amount accrued, P is the principal, r is the rate of interest, and t is the time, in years. Approximately how many years will it take for Susie's money to double?
1) 1.4
2) 6.0
3) 13.9
4) 14.7

285 Which ratio represents $\csc A$ in the diagram below?
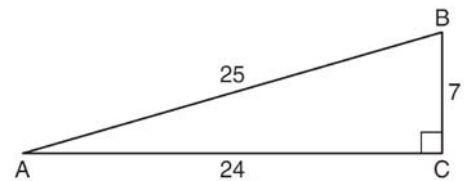
1) $\dfrac{25}{24}$

2) $\dfrac{25}{7}$

3) $\dfrac{24}{7}$

4) $\dfrac{7}{24}$

286 The graph of $y = f(x)$ is shown below.
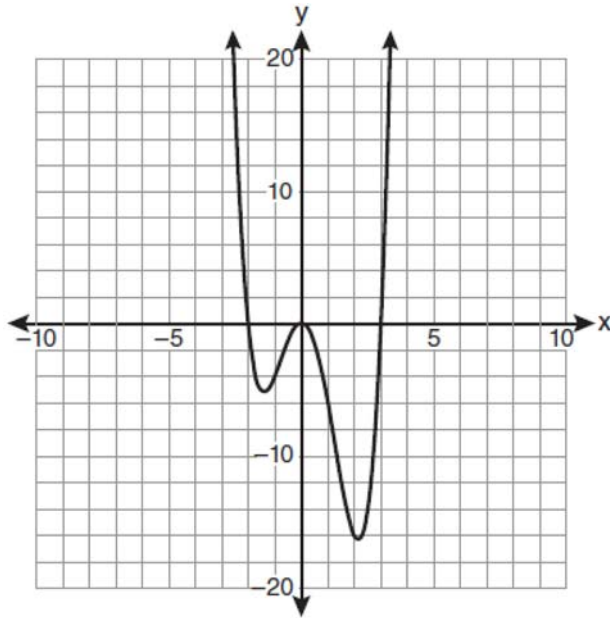
Which set lists all the real solutions of $f(x) = 0$?
1) $\{-3, 2\}$
2) $\{-2, 3\}$
3) $\{-3, 0, 2\}$
4) $\{-2, 0, 3\}$

287 If order does *not* matter, which selection of students would produce the most possible committees?
1) 5 out of 15
2) 5 out of 25
3) 20 out of 25
4) 15 out of 25

288 Solve algebraically for all values of x:
$x^4 + 4x^3 + 4x^2 = -16x$

289 Brian correctly used a method of completing the square to solve the equation $x^2 + 7x - 11 = 0$. Brian's first step was to rewrite the equation as $x^2 + 7x = 11$. He then added a number to both sides of the equation. Which number did he add?
1) $\dfrac{7}{2}$
2) $\dfrac{49}{4}$
3) $\dfrac{49}{2}$
4) 49

290 Akeem invests $25,000 in an account that pays 4.75% annual interest compounded continuously. Using the formula $A = Pe^{rt}$, where A = the amount in the account after t years, P = principal invested, and r = the annual interest rate, how many years, to the *nearest tenth*, will it take for Akeem's investment to triple?
1) 10.0
2) 14.6
3) 23.1
4) 24.0

291 Which value of r represents data with a strong negative linear correlation between two variables?
1) −1.07
2) −0.89
3) −0.14
4) 0.92

292 Solve algebraically for x: $\dfrac{1}{x+3} - \dfrac{2}{3-x} = \dfrac{4}{x^2-9}$

43

293 Express in simplest form: $\dfrac{\dfrac{4-x^2}{x^2+7x+12}}{\dfrac{2x-4}{x+3}}$

294 The value of $\tan 126°43'$ to the *nearest ten-thousandth* is
1) −1.3407
2) −1.3408
3) −1.3548
4) −1.3549

295 The expression $\log 4m^2$ is equivalent to
1) $2(\log 4 + \log m)$
2) $2\log 4 + \log m$
3) $\log 4 + 2\log n$
4) $\log 16 + 2\log m$

296 If $f(x) = \dfrac{x}{x^2-16}$, what is the value of $f(-10)$?
1) $-\dfrac{5}{2}$
2) $-\dfrac{5}{42}$
3) $\dfrac{5}{58}$
4) $\dfrac{5}{18}$

297 Express $\cos\theta(\sec\theta - \cos\theta)$, in terms of $\sin\theta$.

298 An angle, P, drawn in standard position, terminates in Quadrant II if
1) $\cos P < 0$ and $\csc P < 0$
2) $\sin P > 0$ and $\cos P > 0$
3) $\csc P > 0$ and $\cot P < 0$
4) $\tan P < 0$ and $\sec P > 0$

299 Which equation is represented by the graph below?
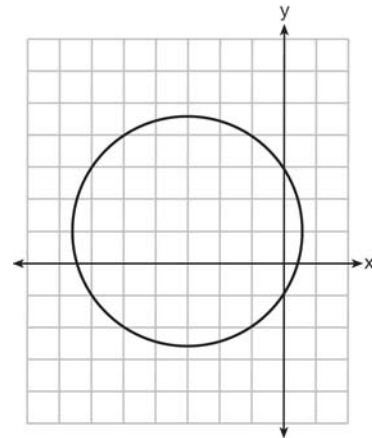
1) $(x-3)^2 + (y+1)^2 = 5$
2) $(x+3)^2 + (y-1)^2 = 5$
3) $(x-1)^2 + (y+3)^2 = 13$
4) $(x+3)^2 + (y-1)^2 = 13$

300 What is the common difference of the arithmetic sequence $5, 8, 11, 14$?
1) $\dfrac{8}{5}$
2) -3
3) 3
4) 9

301 In $\triangle ABC$, $a = 15$, $b = 14$, and $c = 13$, as shown in the diagram below. What is the m$\angle C$, to the *nearest degree*?
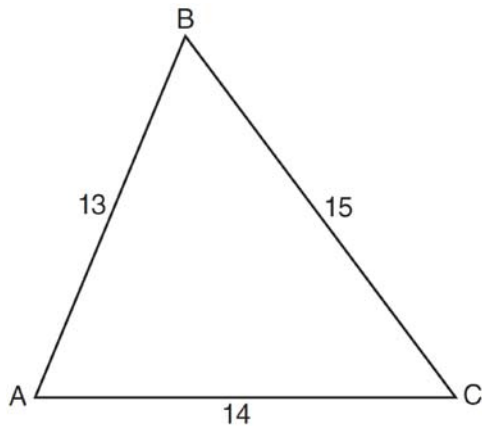
1) 53
2) 59
3) 67
4) 127

302 The sum of the first eight terms of the series
$3 - 12 + 48 - 192 + \ldots$ is
1) $-13,107$
2) $-21,845$
3) $-39,321$
4) $-65,535$

303 Express in simplest form: $\dfrac{\dfrac{1}{2} - \dfrac{4}{d}}{\dfrac{1}{d} + \dfrac{3}{2d}}$

304 If $f(x) = x^2 - 6$ and $g(x) = 2^x - 1$, determine the value of $(g \circ f)(-3)$.

305 Solve algebraically for all values of x:
$81^{x^3 + 2x^2} = 27^{\frac{5x}{3}}$

306 What is the range of $f(x) = (x + 4)^2 + 7$?
1) $y \geq -4$
2) $y \geq 4$
3) $y = 7$
4) $y \geq 7$

307 What is a formula for the nth term of sequence B shown below?
$$B = 10, 12, 14, 16, \ldots$$
1) $b_n = 8 + 2n$
2) $b_n = 10 + 2n$
3) $b_n = 10(2)^n$
4) $b_n = 10(2)^{n-1}$

308 Write a quadratic equation such that the sum of its roots is 6 and the product of its roots is -27.

309 Which equation has roots with the sum equal to $\dfrac{9}{4}$ and the product equal to $\dfrac{3}{4}$?
1) $4x^2 + 9x + 3 = 0$
2) $4x^2 + 9x - 3 = 0$
3) $4x^2 - 9x + 3 = 0$
4) $4x^2 - 9x - 3 = 0$

310 Which graph represents one complete cycle of the equation $y = \sin 3\pi x$?

1)

2)

3)

4)
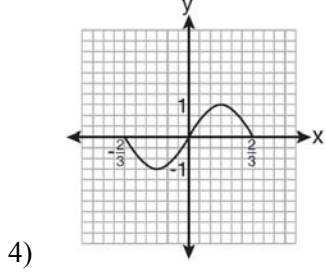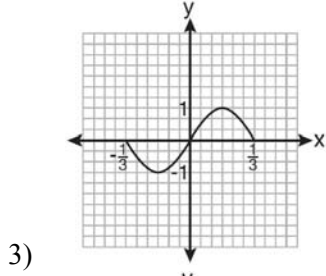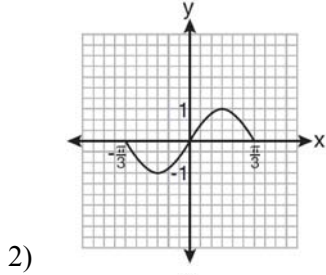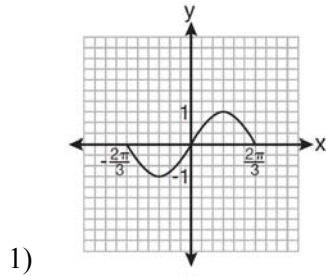
311 Find, algebraically, the measure of the obtuse angle, to the *nearest degree*, that satisfies the equation $5\csc\theta = 8$.

312 Which equation is represented by the graph below?
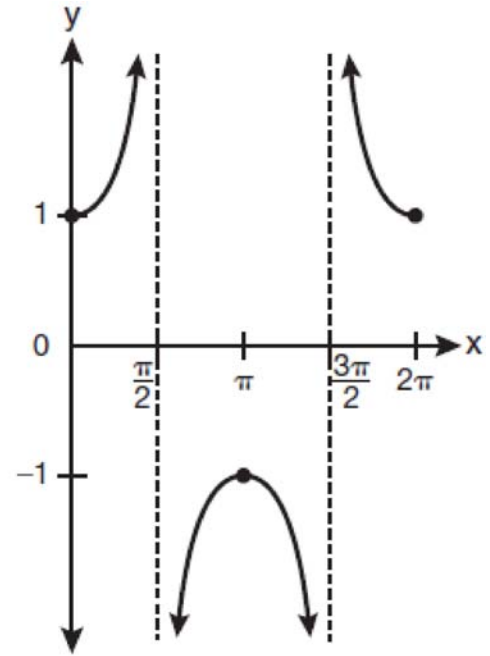
1) $y = \cot x$
2) $y = \csc x$
3) $y = \sec x$
4) $y = \tan x$

313 The fraction $\dfrac{3}{\sqrt{3a^2b}}$ is equivalent to

1) $\dfrac{1}{a\sqrt{b}}$

2) $\dfrac{\sqrt{b}}{ab}$

3) $\dfrac{\sqrt{3b}}{ab}$

4) $\dfrac{\sqrt{3}}{a}$

314 In the diagram below of right triangle KTW, $KW = 6$, $KT = 5$, and $m\angle KTW = 90$.
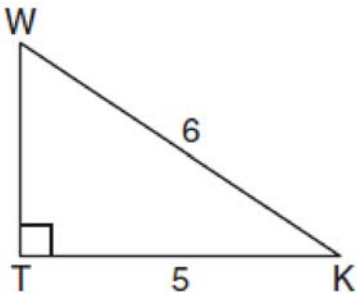
What is the measure of $\angle K$, to the *nearest minute*?
1) 33°33'
2) 33°34'
3) 33°55'
4) 33°56'

315 What is the middle term in the expansion of $\left(\dfrac{x}{2} - 2y\right)^6$?

1) $20x^3y^3$
2) $-\dfrac{15}{4}x^4y^2$
3) $-20x^3y^3$
4) $\dfrac{15}{4}x^4y^2$

316 Four points on the graph of the function f(x) are shown below.
$$\{(0,1),(1,2),(2,4),(3,8)\}$$
Which equation represents f(x)?

1) f(x) = 2^x
2) f(x) = $2x$
3) f(x) = $x + 1$
4) f(x) = $\log_2 x$

317 Which value of r represents data with a strong positive linear correlation between two variables?
1) 0.89
2) 0.34
3) 1.04
4) 0.01

318 In which graph is θ coterminal with an angle of $-70°$?

1)

2)

3)

4)

47

319 The roots of the equation $2x^2 + 7x - 3 = 0$ are
1) $-\dfrac{1}{2}$ and -3
2) $\dfrac{1}{2}$ and 3
3) $\dfrac{-7 \pm \sqrt{73}}{4}$
4) $\dfrac{7 \pm \sqrt{73}}{4}$

320 The value of x in the equation $4^{2x+5} = 8^{3x}$ is
1) 1
2) 2
3) 5
4) -10

321 During a particular month, a local company surveyed all its employees to determine their travel times to work, in minutes. The data for all 15 employees are shown below.

$$
\begin{array}{ccccc}
25 & 55 & 40 & 65 & 29 \\
45 & 59 & 35 & 25 & 37 \\
52 & 30 & 8 & 40 & 55
\end{array}
$$

Determine the number of employees whose travel time is within one standard deviation of the mean.

322 The members of a men's club have a choice of wearing black or red vests to their club meetings. A study done over a period of many years determined that the percentage of black vests worn is 60%. If there are 10 men at a club meeting on a given night, what is the probability, to the *nearest thousandth*, that *at least* 8 of the vests worn will be black?

323 Solve the following systems of equations algebraically: $5 = y - x$
$$4x^2 = -17x + y + 4$$

324 A study shows that 35% of the fish caught in a local lake had high levels of mercury. Suppose that 10 fish were caught from this lake. Find, to the *nearest tenth of a percent,* the probability that *at least* 8 of the 10 fish caught did *not* contain high levels of mercury.

325 Ten teams competed in a cheerleading competition at a local high school. Their scores were 29, 28, 39, 37, 45, 40, 41, 38, 37, and 48. How many scores are within one population standard deviation from the mean? For these data, what is the interquartile range?

326 Ms. Bell's mathematics class consists of 4 sophomores, 10 juniors, and 5 seniors. How many different ways can Ms. Bell create a four-member committee of juniors if each junior has an equal chance of being selected?
1) 210
2) 3,876
3) 5,040
4) 93,024

327 What are the domain and the range of the function shown in the graph below?
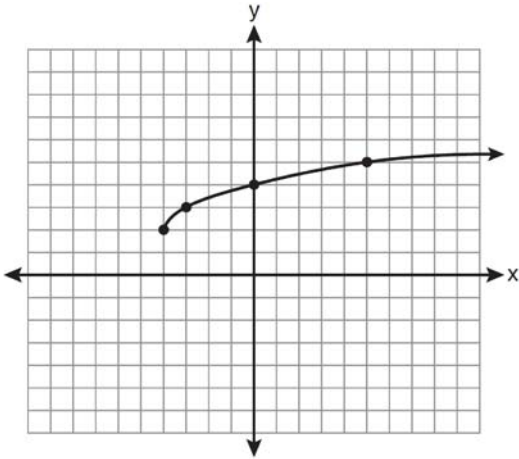
1) $\{x|x > -4\}; \{y|y > 2\}$
2) $\{x|x \geq -4\}; \{y|y \geq 2\}$
3) $\{x|x > 2\}; \{y|y > -4\}$
4) $\{x|x \geq 2\}; \{y|y \geq -4\}$

328 If $f(x) = x^2 - 6$, find $f^{-1}(x)$.

329 The simplest form of $\dfrac{1 - \dfrac{4}{x}}{1 - \dfrac{2}{x} - \dfrac{8}{x^2}}$ is

1) $\dfrac{1}{2}$

2) $\dfrac{x}{x+2}$

3) $\dfrac{x}{3}$

4) $-\dfrac{x}{x-2}$

330 The solutions of the equation $y^2 - 3y = 9$ are

1) $\dfrac{3 \pm 3i\sqrt{3}}{2}$

2) $\dfrac{3 \pm 3i\sqrt{5}}{2}$

3) $\dfrac{-3 \pm 3\sqrt{5}}{2}$

4) $\dfrac{3 \pm 3\sqrt{5}}{2}$

331 The product of i^7 and i^5 is equivalent to
1) 1
2) -1
3) i
4) $-i$

332 Graph the inequality $-3|6 - x| < -15$ for x. Graph the solution on the line below.

333 An amateur bowler calculated his bowling average for the season. If the data are normally distributed, about how many of his 50 games were within one standard deviation of the mean?
1) 14
2) 17
3) 34
4) 48

49

334 The expression $\sqrt[3]{64a^{16}}$ is equivalent to
1) $8a^4$
2) $8a^8$
3) $4a^5\sqrt[3]{a}$
4) $4a\sqrt[3]{a^5}$

335 In $\triangle PQR$, p equals
1) $\dfrac{r\sin P}{\sin Q}$
2) $\dfrac{r\sin P}{\sin R}$
3) $\dfrac{r\sin R}{\sin P}$
4) $\dfrac{q\sin R}{\sin Q}$

336 Which equation is represented by the graph below?
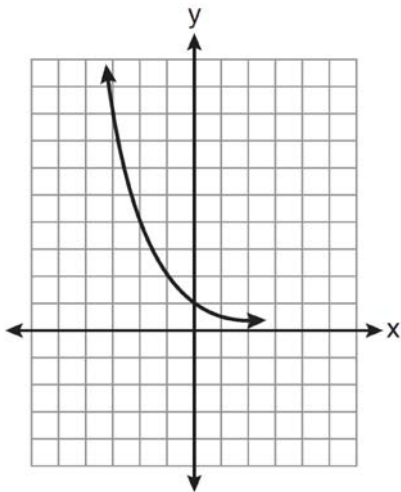
1) $y = 5^x$
2) $y = 0.5^x$
3) $y = 5^{-x}$
4) $y = 0.5^{-x}$

337 As shown in the table below, a person's target heart rate during exercise changes as the person gets older.

Age (years)	Target Heart Rate (beats per minute)
20	135
25	132
30	129
35	125
40	122
45	119
50	115

Which value represents the linear correlation coefficient, rounded to the *nearest thousandth*, between a person's age, in years, and that person's target heart rate, in beats per minute?
1) −0.999
2) −0.664
3) 0.998
4) 1.503

338 What is the radian measure of an angle whose measure is −420°?
1) $-\dfrac{7\pi}{3}$
2) $-\dfrac{7\pi}{6}$
3) $\dfrac{7\pi}{6}$
4) $\dfrac{7\pi}{3}$

339 What is the solution set for $2\cos\theta - 1 = 0$ in the interval $0° \leq \theta < 360°$?
1) $\{30°, 150°\}$
2) $\{60°, 120°\}$
3) $\{30°, 330°\}$
4) $\{60°, 300°\}$

340 The value of $\csc 138°23'$ rounded to four decimal places is
1) -1.3376
2) -1.3408
3) 1.5012
4) 1.5057

341 The table below displays the results of a survey regarding the number of pets each student in a class has. The average number of pets per student in this class is 2.

Number of Pets	0	1	2	3	4	5
Number of Students	4	6	10	0	k	2

What is the value of k for this table?
1) 9
2) 2
3) 8
4) 4

342 The expression $2i^2 + 3i^3$ is equivalent to
1) $-2 - 3i$
2) $2 - 3i$
3) $-2 + 3i$
4) $2 + 3i$

343 The scores of one class on the Unit 2 mathematics test are shown in the table below.

Unit 2 Mathematics Test

Test Score	Frequency
96	1
92	2
84	5
80	3
76	6
72	3
68	2

Find the population standard deviation of these scores, to the *nearest tenth*.

344 The solution set of $4^{x^2 + 4x} = 2^{-6}$ is
1) $\{1, 3\}$
2) $\{-1, 3\}$
3) $\{-1, -3\}$
4) $\{1, -3\}$

345 In $\triangle ABC$, $a = 3$, $b = 5$, and $c = 7$. What is $m\angle C$?
1) 22
2) 38
3) 60
4) 120

346 The expression $4 + \sum\limits_{k=2}^{5} 3(k - x)$ is equal to
1) $58 - 4x$
2) $46 - 4x$
3) $58 - 12x$
4) $46 - 12x$

347 In $\triangle KLM$, $KL = 20$, $LM = 13$, and $m\angle K = 40$. The measure of $\angle M$?
1) must be between 0° and 90°
2) must equal 90°
3) must be between 90° and 180°
4) is ambiguous

348 What is the period of the function
$y = \dfrac{1}{2} \sin\left(\dfrac{x}{3} - \pi\right)$?
1) $\dfrac{1}{2}$
2) $\dfrac{1}{3}$
3) $\dfrac{2}{3}\pi$
4) 6π

349 What is the radian measure of the smaller angle formed by the hands of a clock at 7 o'clock?
1) $\dfrac{\pi}{2}$
2) $\dfrac{2\pi}{3}$
3) $\dfrac{5\pi}{6}$
4) $\dfrac{7\pi}{6}$

350 Factor the expression $12t^8 - 75t^4$ completely.

351 Which graph represents the solution set of
$\left|\dfrac{4x - 5}{3}\right| > 1$?
1)
2)
3)
4)

Algebra 2/Trigonometry Regents at Random
Answer Section

1 ANS: 2   PTS: 2   REF: 011315a2   STA: A2.A.55
    TOP: Trigonometric Ratios

2 ANS: 1

$6x - 7 \le 5$ $6x - 7 \ge -5$

     $6x \le 12$ $6x \ge 2$

      $x \le 2$ $x \ge \dfrac{1}{3}$

    PTS: 2   REF: fall0905a2   STA: A2.A.1   TOP: Absolute Value Inequalities
    KEY: graph

3 ANS: 4
$s = \theta r = 2 \cdot 4 = 8$

    PTS: 2   REF: fall0922a2   STA: A2.A.61   TOP: Arc Length
    KEY: arc length

4 ANS: 3
$_3C_2(2x^4)^1(-y)^2 = 6x^4y^2$

    PTS: 2   REF: 011215a2   STA: A2.A.36   TOP: Binomial Expansions

5 ANS: 2   PTS: 2   REF: 011114a2   STA: A2.N.3
    TOP: Operations with Polynomials

6 ANS:

$x < -1$ or $x > 5$. $x^2 - 4x - 5 > 0$. $x - 5 > 0$ and $x + 1 > 0$ or $x - 5 < 0$ and $x + 1 < 0$

                    $(x - 5)(x + 1) > 0$ $x > 5$ and $x > -1$ $x < 5$ and $x < -1$

                                            $x > 5$ $x < -1$

    PTS: 2   REF: 011228a2   STA: A2.A.4   TOP: Quadratic Inequalities
    KEY: one variable

7 ANS: 4

$g\left(\dfrac{1}{2}\right) = \dfrac{1}{\dfrac{1}{2}} = 2$. $f(2) = 4(2) - 2^2 = 4$

    PTS: 2   REF: 011204a2   STA: A2.A.42   TOP: Compositions of Functions
    KEY: numbers

8 ANS: 2
sum: $\dfrac{-b}{a} = \dfrac{4}{6} = \dfrac{2}{3}$.   product: $\dfrac{c}{a} = \dfrac{-12}{6} = -2$

    PTS: 2   REF: 011209a2   STA: A2.A.20   TOP: Roots of Quadratics

9 ANS:

88. $\dfrac{100}{\sin 33} = \dfrac{x}{\sin 32}$. $\sin 66 \approx \dfrac{T}{97.3}$

$x \approx 97.3$ $\qquad$ $t \approx 88$

PTS: 4 $\qquad$ REF: 011236a2 $\qquad$ STA: A2.A.73 $\qquad$ TOP: Law of Sines
KEY: advanced

10 ANS: 1

$\sqrt{12^2 - 6^2} = \sqrt{108} = \sqrt{36}\sqrt{3} = 6\sqrt{3}$. $\cot J = \dfrac{A}{O} = \dfrac{6}{6\sqrt{3}} \cdot \dfrac{\sqrt{3}}{\sqrt{3}} = \dfrac{\sqrt{3}}{3}$

PTS: 2 $\qquad$ REF: 011120a2 $\qquad$ STA: A2.A.55 $\qquad$ TOP: Trigonometric Ratios

11 ANS:

$\dfrac{100}{\sin 32} = \dfrac{b}{\sin 105}$. $\dfrac{100}{\sin 32} = \dfrac{a}{\sin 43}$

$b \approx 182.3$ $\qquad$ $a \approx 128.7$

PTS: 4 $\qquad$ REF: 011338a2 $\qquad$ STA: A2.A.73 $\qquad$ TOP: Law of Sines
KEY: basic

12 ANS: 2

$\dfrac{\dfrac{x}{4} - \dfrac{1}{x}}{\dfrac{1}{2x} + \dfrac{1}{4}} = \dfrac{\dfrac{x^2 - 4}{4x}}{\dfrac{2x + 4}{8x}} = \dfrac{(x + 2)(x - 2)}{4x} \times \dfrac{8x}{2(x + 2)} = x - 2$

PTS: 2 $\qquad$ REF: fall0920a2 $\qquad$ STA: A2.A.17 $\qquad$ TOP: Complex Fractions

13 ANS: 3 $\qquad$ PTS: 2 $\qquad$ REF: fall0923a2 $\qquad$ STA: A2.A.39
TOP: Domain and Range $\qquad$ KEY: real domain

14 ANS: 3

$-\sqrt{2}\sec x = 2$

$\sec x = -\dfrac{2}{\sqrt{2}}$

$\cos x = -\dfrac{\sqrt{2}}{2}$

$x = 135, 225$

PTS: 2 $\qquad$ REF: 011322a2 $\qquad$ STA: A2.A.68 $\qquad$ TOP: Trigonometric Equations
KEY: reciprocal functions

15   ANS: 2

$\log x^2 = \log 3a + \log 2a$

$2\log x = \log 6a^2$

$\log x = \dfrac{\log 6}{2} + \dfrac{\log a^2}{2}$

$\log x = \dfrac{1}{2}\log 6 + \dfrac{2\log a}{2}$

$\log x = \dfrac{1}{2}\log 6 + \log a$

PTS: 2   REF: 011224a2   STA: A2.A.19   TOP: Properties of Logarithms
KEY: splitting logs

16   ANS: 4   PTS: 2   REF: 011219a2   STA: A2.A.52
TOP: Properties of Graphs of Functions and Relations

17   ANS:

$\dfrac{\sqrt{108x^5y^8}}{\sqrt{6xy^5}} = \sqrt{18x^4y^3} = 3x^2y\sqrt{2y}$

PTS: 2   REF: 011133a2   STA: A2.A.14   TOP: Operations with Radicals
KEY: with variables | index = 2

18   ANS:
D: $-5 \le x \le 8$. R: $-3 \le y \le 2$

PTS: 2   REF: 011132a2   STA: A2.A.51   TOP: Domain and Range

19   ANS: 1

$\dfrac{9}{\sin A} = \dfrac{10}{\sin 70}$. $58° + 70°$ is possible. $122° + 70°$ is not possible.

$A = 58$

PTS: 2   REF: 011210a2   STA: A2.A.75   TOP: Law of Sines - The Ambiguous Case

20   ANS: 2

$\dfrac{10}{\sin 35} = \dfrac{13}{\sin B}$. $35 + 48 < 180$

$B \approx 48, 132$ $35 + 132 < 180$

PTS: 2   REF: 011113a2   STA: A2.A.75   TOP: Law of Sines - The Ambiguous Case

21   ANS: 3   PTS: 2   REF: 011305a2   STA: A2.A.38
TOP: Defining Functions   KEY: graphs

22   ANS:
$r = \sqrt{2^2 + 3^2} = \sqrt{13}$. $(x + 5)^2 + (y - 2)^2 = 13$

PTS: 2   REF: 011234a2   STA: A2.A.49   TOP: Writing Equations of Circles

23 ANS: 1
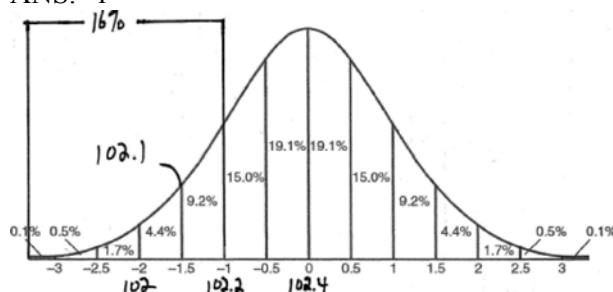
PTS: 2 REF: fall0915a2 STA: A2.S.5 TOP: Normal Distributions
KEY: interval

24 ANS:

$\ln(T - T_0) = -kt + 4.718$. $\ln(T - 68) = -0.104(10) + 4.718$.

$\ln(150 - 68) = -k(3) + 4.718$ $\ln(T - 68) = 3.678$

$4.407 \approx -3k + 4.718$ $T - 68 \approx 39.6$

$k \approx 0.104$ $T \approx 108$

PTS: 6 REF: 011139a2 STA: A2.A.28 TOP: Logarithmic Equations
KEY: advanced

25 ANS:
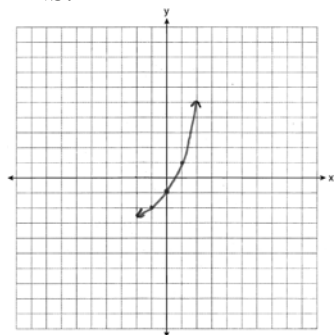
PTS: 2 REF: 011234a2 STA: A2.A.53 TOP: Graphing Exponential Functions

26 ANS: 1 PTS: 2 REF: 011117a2 STA: A2.S.9
TOP: Differentiating Permutations and Combinations

27 ANS: 1 PTS: 2 REF: 011310a2 STA: A2.S.9
TOP: Differentiating Permutations and Combinations

28 ANS:
$_{25}C_{20} = 53,130$

PTS: 2 REF: 011232a2 STA: A2.S.11 TOP: Combinations

29 ANS:
$12 \cdot 6 = 9w$

$8 = w$

PTS: 2 REF: 011130a2 STA: A2.A.5 TOP: Inverse Variation

30 ANS: 1
$8 \times 8 \times 7 \times 1 = 448$. The first digit cannot be 0 or 5. The second digit cannot be 5 or the same as the first digit. The third digit cannot be 5 or the same as the first or second digit.

PTS: 2 REF: 011125a2 STA: A2.S.10 TOP: Permutations

31 ANS: 4
$\dfrac{10}{4} = 2.5$

PTS: 2 REF: 011217a2 STA: A2.A.29 TOP: Sequences

32 ANS: 1 PTS: 2 REF: fall0914a2 STA: A2.A.9
TOP: Negative and Fractional Exponents

33 ANS:
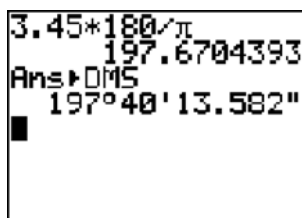
197º40'. $3.45 \times \dfrac{180}{\pi} \approx 197°40'$.

PTS: 2 REF: fall0931a2 STA: A2.M.2 TOP: Radian Measure
KEY: degrees

34 ANS: 1

$4a + 6 = 4a - 10.$ $4a + 6 = -4a + 10.$ $\left| 4\left(\dfrac{1}{2}\right) + 6 \right| - 4\left(\dfrac{1}{2}\right) = -10$

$\quad 6 \neq -10 \qquad\qquad 8a = 4$

$\qquad\qquad\qquad\qquad a = \dfrac{4}{8} = \dfrac{1}{2} \qquad 8 - 2 \neq -10$

PTS: 2 REF: 011106a2 STA: A2.A.1 TOP: Absolute Value Equations

35 ANS: 3
$\dfrac{4}{-2} = -2$

PTS: 2 REF: 011304a2 STA: A2.A.31 TOP: Sequences

36 ANS: 2 PTS: 2 REF: 011208a2 STA: A2.A.67
TOP: Proving Trigonometric Identities

37 ANS: 1
$\dfrac{1}{2}(7.4)(3.8)\sin 126 \approx 11.4$

PTS: 2 REF: 011218a2 STA: A2.A.74 TOP: Using Trigonometry to Find Area
KEY: basic

5

38 ANS: 1

$_5C_3(3x)^2(-2)^3 = 10 \cdot 9x^2 \cdot -8 = -720x^2$

PTS: 2   REF: fall0919a2   STA: A2.A.36   TOP: Binomial Expansions

39 ANS:

0.468. $_8C_6\left(\dfrac{2}{3}\right)^6\left(\dfrac{1}{3}\right)^2 \approx 0.27313.$ $_8C_7\left(\dfrac{2}{3}\right)^7\left(\dfrac{1}{3}\right)^1 \approx 0.15607.$ $_8C_8\left(\dfrac{2}{3}\right)^8\left(\dfrac{1}{3}\right)^0 \approx 0.03902.$

PTS: 4   REF: 011138a2   STA: A2.S.15   TOP: Binomial Probability
KEY: at least or at most

40 ANS: 1

$\dfrac{_6P_6}{3!2!} = \dfrac{720}{12} = 60$

PTS: 2   REF: 011324a2   STA: A2.S.10   TOP: Permutations

41 ANS: 3

$x^2 - 3x - 10 > 0$ or

$(x - 5)(x + 2) > 0$ $x - 5 < 0$ and $x + 2 < 0$

$x - 5 > 0$ and $x + 2 > 0$ $x < 5$ and $x < -2$

$x > 5$ and $x > -2$ $x < -2$

$x > 5$

PTS: 2   REF: 011115a2   STA: A2.A.4   TOP: Quadratic Inequalities
KEY: one variable

42 ANS: 2

$(3 - 7i)(3 - 7i) = 9 - 21i - 21i + 49i^2 = 9 - 42i - 49 = -40 - 42i$

PTS: 2   REF: fall0901a2   STA: A2.N.9
TOP: Multiplication and Division of Complex Numbers

43 ANS:

$3x^2 - 11x + 6 = 0.$ Sum $\dfrac{-b}{a} = \dfrac{11}{3}.$ Product $\dfrac{c}{a} = \dfrac{6}{3} = 2$

PTS: 2   REF: 011329a2   STA: A2.A.20   TOP: Roots of Quadratics

44 ANS: 4   PTS: 2   REF: 011101a2   STA: A2.A.38
TOP: Defining Functions   KEY: graphs

45 ANS: 2

$$\log 9 - \log 20$$

$$\log 3^2 - \log(10 \cdot 2)$$

$$2\log 3 - (\log 10 + \log 2)$$

$$2b - (1 + a)$$

$$2b - a - 1$$

PTS: 2   REF: 011326a2   STA: A2.A.19   TOP: Properties of Logarithms
KEY: expressing logs algebraically

46 ANS: 4

$$\frac{2\pi}{b} = 30$$

$$b = \frac{\pi}{15}$$

PTS: 2   REF: 011227a2   STA: A2.A.72
TOP: Identifying the Equation of a Trigonometric Graph

47 ANS: 3

$$\left(\frac{2}{3}\right)^2 + \cos^2 A = 1 \qquad\qquad \sin 2A = 2\sin A \cos A$$

$$\cos^2 A = \frac{5}{9} \qquad\qquad = 2\left(\frac{2}{3}\right)\left(\frac{\sqrt{5}}{3}\right)$$

$$\cos A = +\frac{\sqrt{5}}{3}, \text{ sin A is acute.} \qquad = \frac{4\sqrt{5}}{9}$$

PTS: 2   REF: 011107a2   STA: A2.A.77   TOP: Double Angle Identities
KEY: evaluating

48 ANS:

$$\sqrt{x^2 + x - 1} = -4x + 3 \qquad\qquad -4\left(\frac{2}{3}\right) + 3 \geq 0$$

$$x^2 + x - 1 = 16x^2 - 24x + 9$$

$$0 = 15x^2 - 25x + 10 \qquad\qquad \frac{1}{3} \geq 0$$

$$0 = 3x^2 - 5x + 2 \qquad -4(1) + 3 < 0$$

$$0 = (3x - 2)(x - 1) \qquad\qquad 1 \text{ is extraneous}$$

$$x = \frac{2}{3}, \ x \neq 1$$

PTS: 6   REF: 011339a2   STA: A2.A.22   TOP: Solving Radicals
KEY: extraneous solutions

49 ANS: 3

$a_n = 5(-2)^{n-1}$

$a_{15} = 5(-2)^{15-1} = 81,920$

PTS: 2   REF: 011105a2   STA: A2.A.32   TOP: Sequences

50 ANS:

Ordered, the heights are 71, 71, 72, 74, 74, 75, 78, 79, 79, 83. $Q_1 = 72$ and $Q_3 = 79$. $79 - 72 = 7$.

PTS: 2   REF: 011331a2   STA: A2.S.4   TOP: Dispersion
KEY: range, quartiles, interquartile range, variance

51 ANS: 4

(4) fails the horizontal line test. Not every element of the range corresponds to only one element of the domain.

PTS: 2   REF: fall0906a2   STA: A2.A.43   TOP: Defining Functions

52 ANS: 1

$\tan\theta - \sqrt{3} = 0$

$\quad \tan\theta = \sqrt{3}$

$\quad\quad \theta = \tan^{-1}\sqrt{3}$

$\quad\quad \theta = 60, 240$
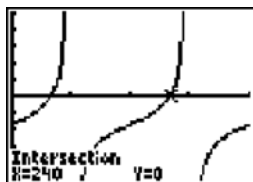
PTS: 2   REF: fall0903a2   STA: A2.A.68   TOP: Trigonometric Equations
KEY: basic

53 ANS: 3   PTS: 2   REF: 011110a2   STA: A2.A.30
TOP: Sequences

54 ANS: 3
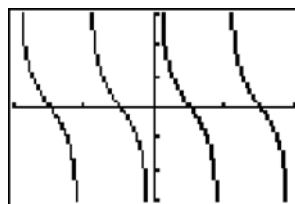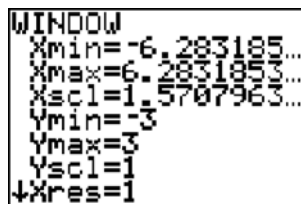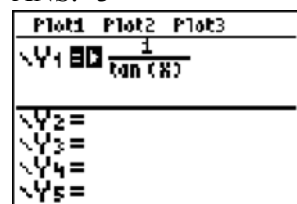
PTS: 2   REF: 011207a2   STA: A2.A.71   TOP: Graphing Trigonometric Functions

55 ANS:

$30700 = 50e^{3t}$

$614 = e^{3t}$

$\ln 614 = \ln e^{3t}$

$\ln 614 = 3t \ln e$

$\ln 614 = 3t$

$2.14 \approx t$

PTS: 2   REF: 011333a2   STA: A2.A.6   TOP: Exponential Growth

56 ANS: 4   PTS: 2   REF: 011201a2   STA: A2.S.2
TOP: Analysis of Data

57 ANS: 3

$b^2 - 4ac = (-10)^2 - 4(1)(25) = 100 - 100 = 0$

PTS: 2   REF: 011102a2   STA: A2.A.2   TOP: Using the Discriminant
KEY: determine nature of roots given equation

58 ANS:

$a + 15 + 2a = 90$

$3a + 15 = 90$

$3a = 75$

$a = 25$

PTS: 2   REF: 011330a2   STA: A2.A.58   TOP: Cofunction Trigonometric Relationships

59 ANS:

$3 \times \dfrac{180}{\pi} \approx 171.89° \approx 171°53'.$

PTS: 2   REF: 011335a2   STA: A2.M.2   TOP: Radian Measure
KEY: degrees

60 ANS: 3

$\dfrac{-b}{a} = \dfrac{-6}{2} = -3.$ $\dfrac{c}{a} = \dfrac{4}{2} = 2$

PTS: 2   REF: 011121a2   STA: A2.A.21   TOP: Roots of Quadratics
KEY: basic

61 ANS:

−104.

PTS: 2 REF: 011230a2 STA: A2.N.10 TOP: Sigma Notation
KEY: basic

62 ANS:

$-\dfrac{a^2 b^3}{4}$

PTS: 2 REF: 011231a2 STA: A2.A.13 TOP: Simplifying Radicals
KEY: index > 2

63 ANS: 4

$$(x+i)^2 - (x-i)^2 = x^2 + 2xi + i^2 - (x^2 - 2xi + i^2) = 4xi$$

PTS: 2 REF: 011327a2 STA: A2.N.9
TOP: Multiplication and Division of Complex Numbers

64 ANS: 2

$$320 = 10(2)^{\frac{t}{60}}$$

$$32 = (2)^{\frac{t}{60}}$$

$$\log 32 = \log(2)^{\frac{t}{60}}$$

$$\log 32 = \frac{t \log 2}{60}$$

$$\frac{60 \log 32}{\log 2} = t$$

$$300 = t$$

PTS: 2 REF: 011205a2 STA: A2.A.6 TOP: Exponential Growth

65 ANS: 2

$$x^3 + x^2 - 2x = 0$$

$$x(x^2 + x - 2) = 0$$

$$x(x+2)(x-1) = 0$$

$$x = 0, -2, 1$$

PTS: 2 REF: 011103a2 STA: A2.A.26 TOP: Solving Polynomial Equations

66 ANS:

$y = 27.2025(1.1509)^x.$ $y = 27.2025(1.1509)^{18} \approx 341$

PTS: 4 REF: 011238a2 STA: A2.S.7 TOP: Exponential Regression

67 ANS: 4

$2\log_4(5x) = 3$

$\log_4(5x) = \dfrac{3}{2}$

$5x = 4^{\frac{3}{2}}$

$5x = 8$

$x = \dfrac{8}{5}$

PTS: 2 REF: fall0921a2 STA: A2.A.28 TOP: Logarithmic Equations
KEY: advanced

68 ANS:

$\dfrac{2\sqrt{3}}{3}.$ If $\sin 60 = \dfrac{\sqrt{3}}{2}$, then $\csc 60 = \dfrac{2}{\sqrt{3}} \cdot \dfrac{\sqrt{3}}{\sqrt{3}} = \dfrac{2\sqrt{3}}{3}$

PTS: 2 REF: 011235a2 STA: A2.A.59 TOP: Reciprocal Trigonometric Relationships

69 ANS: 4

$\dfrac{2x+4}{\sqrt{x+2}} \cdot \dfrac{\sqrt{x+2}}{\sqrt{x+2}} = \dfrac{2(x+2)\sqrt{x+2}}{x+2} = 2\sqrt{x+2}$

PTS: 2 REF: 011122a2 STA: A2.A.15 TOP: Rationalizing Denominators
KEY: index = 2

70 ANS: 3
$34.1\% + 19.1\% = 53.2\%$

PTS: 2 REF: 011212a2 STA: A2.S.5 TOP: Normal Distributions
KEY: probability

71 ANS: 1 PTS: 2 REF: 011112a2 STA: A2.A.64
TOP: Using Inverse Trigonometric Functions KEY: advanced

72 ANS:

$2.5 \cdot \dfrac{180}{\pi} \approx 143.2°$

PTS: 2 REF: 011129a2 STA: A2.M.2 TOP: Radian Measure
KEY: degrees

73 ANS: 2
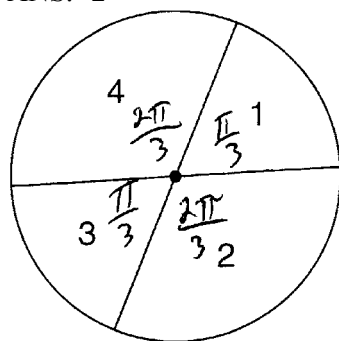
$$\frac{\dfrac{\pi}{3}+\dfrac{\pi}{3}}{2\pi}=\frac{\dfrac{2\pi}{3}}{2\pi}=\frac{1}{3}$$

PTS: 2   REF: 011108a2   STA: A2.S.13   TOP: Geometric Probability

74 ANS: 2

$$x^2+2=6x$$

$$x^2-6x=-2$$

$$x^2-6x+9=-2+9$$

$$(x-3)^2=7$$

PTS: 2   REF: 011116a2   STA: A2.A.24   TOP: Completing the Square

75 ANS:

$3\pm\sqrt{7}$. $2x^2-12x+4=0$

$$x^2-6x+2=0$$

$$x^2-6x=-2$$

$$x^2-6x+9=-2+9$$

$$(x-3)^2=7$$

$$x-3=\pm\sqrt{7}$$

$$x=3\pm\sqrt{7}$$

PTS: 4   REF: fall0936a2   STA: A2.A.24   TOP: Completing the Square

76 ANS: 1   PTS: 2   REF: 011306a2   STA: A2.A.8
   TOP: Negative and Fractional Exponents

77 ANS: 1

$$10\cdot\frac{3}{2}=\frac{3}{5}p$$

$$15=\frac{3}{5}p$$

$$25=p$$

PTS: 2   REF: 011226a2   STA: A2.A.5   TOP: Inverse Variation

78 ANS: 2
The binomials are conjugates, so use FL.

PTS: 2   REF: 011206a2   STA: A2.N.3   TOP: Operations with Polynomials

79 ANS: 3
$${}_8C_3 \cdot x^{8-3} \cdot (-2)^3 = 56x^5 \cdot (-8) = -448x^5$$

PTS: 2   REF: 011308a2   STA: A2.A.36   TOP: Binomial Expansions

80 ANS:
$$(x+4)^2 = 17x - 4$$
$$x^2 + 8x + 16 = 17x - 4$$
$$x^2 - 9x + 20 = 0$$
$$(x-4)(x-5) = 0$$
$$x = 4, 5$$

PTS: 4   REF: 011336a2   STA: A2.A.28   TOP: Logarithmic Equations
KEY: basic

81 ANS: 2
$$K = \frac{1}{2}(10)(18)\sin 120 = 45\sqrt{3} \approx 78$$

PTS: 2   REF: fall0907a2   STA: A2.A.74   TOP: Using Trigonometry to Find Area
KEY: basic

82 ANS: 1
$$2 \cdot \frac{180}{\pi} = \frac{360}{\pi}$$

PTS: 2   REF: 011220a2   STA: A2.M.2   TOP: Radian Measure
KEY: degrees

83 ANS:
$$a_n = 9n - 4 \qquad . \quad S_n = \frac{20(5 + 176)}{2} = 1810$$
$$a_1 = 9(1) - 4 = 5$$
$$a_{20} = 9(20) - 4 = 176$$

PTS: 2   REF: 011328a2   STA: A2.A.35   TOP: Summations
KEY: arithmetic

84 ANS: 2
$$f^{-1}(x) = \log_4 x$$

PTS: 2   REF: fall0916a2   STA: A2.A.54   TOP: Graphing Logarithmic Functions

85 ANS: 3   PTS: 2   REF: fall0913a2   STA: A2.A.65
TOP: Graphing Trigonometric Functions

13

86 ANS:

$800.$ $x = 4^{2.5} = 32.$ $y^{-\frac{3}{2}} = 125$. $\dfrac{x}{y} = \dfrac{32}{\frac{1}{25}} = 800$

$$y = 125^{-\frac{2}{3}} = \frac{1}{25}$$

PTS: 4   REF: 011237a2   STA: A2.A.28   TOP: Logarithmic Equations
KEY: advanced

87 ANS: 1
$\sin(180 + x) = (\sin 180)(\cos x) + (\cos 180)(\sin x) = 0 + (-\sin x) = -\sin x$

PTS: 2   REF: 011318a2   STA: A2.A.76   TOP: Angle Sum and Difference Identities
KEY: identities

88 ANS: 2

$\bar{x} \pm \sigma$

153 ± 22

$131 - 175$

PTS: 2   REF: 011307a2   STA: A2.S.5   TOP: Normal Distributions
KEY: interval

89 ANS: 3

$x + y = 5$. $-5 + y = 5$

$y = -x + 5$ $y = 10$

$(x + 3)^2 + (-x + 5 - 3)^2 = 53$

$x^2 + 6x + 9 + x^2 - 4x + 4 = 53$

$2x^2 + 2x - 40 = 0$

$x^2 + x - 20 = 0$

$(x + 5)(x - 4) = 0$

$x = -5, 4$

PTS: 2   REF: 011302a2   STA: A2.A.3   TOP: Quadratic-Linear Systems
KEY: equations

90 ANS: 2
$8^2 = 64$

PTS: 2   REF: fall0909a2   STA: A2.A.18   TOP: Evaluating Logarithmic Expressions

91 ANS: 2   PTS: 2   REF: 011225a2   STA: A2.A.43
TOP: Defining Functions

92 ANS:

$32x^5 - 80x^4 + 80x^3 - 40x^2 + 10x - 1.$ $_5C_0(2x)^5(-1)^0 = 32x^5.$ $_5C_1(2x)^4(-1)^1 = -80x^4.$ $_5C_2(2x)^3(-1)^2 = 80x^3.$ $_5C_3(2x)^2(-1)^3 = -40x^2.$ $_5C_4(2x)^1(-1)^4 = 10x.$ $_5C_5(2x)^0(-1)^5 = -1$

PTS: 4   REF: 011136a2   STA: A2.A.36   TOP: Binomial Expansions

93 ANS: 3   PTS: 2   REF: 011104a2   STA: A2.A.64
TOP: Using Inverse Trigonometric Functions   KEY: unit circle

94 ANS: 2   PTS: 2   REF: fall0926a2   STA: A2.A.46
TOP: Transformations with Functions and Relations

95 ANS: 3   PTS: 2   REF: fall0910a2   STA: A2.A.76
TOP: Angle Sum and Difference Identities   KEY: simplifying

96 ANS:

$3 - 2x \geq 7$ or $3 - 2x \leq -7$

$-2x \geq 4$ $-2x \leq -10$

$x \leq -2$ $x \geq 5$

PTS: 2   REF: 011334a2   STA: A2.A.1   TOP: Absolute Value Inequalities
KEY: graph

97 ANS: 4

$$x^{-\frac{2}{5}} = \frac{1}{x^{\frac{2}{5}}} = \frac{1}{\sqrt[5]{x^2}}$$

PTS: 2   REF: 011118a2   STA: A2.A.10   TOP: Fractional Exponents as Radicals
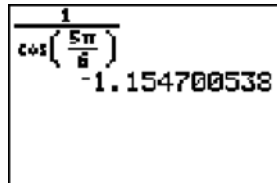
98 ANS: 3

n	0	1	2	Σ
$n^2 + 2^n$	$0^2 + 2^0 = 1$	$1^2 + 2^2 = 3$	$2^2 + 2^2 = 8$	12

$2 \times 12 = 24$

PTS: 2   REF: fall0911a2   STA: A2.N.10   TOP: Sigma Notation
KEY: basic

99 ANS: 1
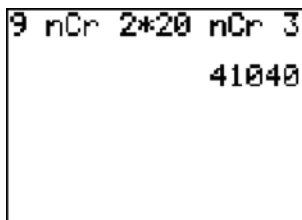
PTS: 2   REF: 011203a2   STA: A2.A.66   TOP: Determining Trigonometric Functions

100 ANS:

$y = 2.001x^{2.298}, 1{,}009.$ $y = 2.001(15)^{2.298} \approx 1009$

PTS: 4   REF: fall0938a2   STA: A2.S.7   TOP: Power Regression

101 ANS:

```
9 nCr 2*20 nCr 3
            41040
```

41,040.

PTS: 2   REF: fall0935a2   STA: A2.S.12   TOP: Sample Space

102 ANS:

$(x + 3)^2 + (y - 4)^2 = 25$

PTS: 2   REF: fall0929a2   STA: A2.A.49   TOP: Writing Equations of Circles

103 ANS:

68% of the students are within one standard deviation of the mean. 16% of the students are more than one standard deviation above the mean.

PTS: 2   REF: 011134a2   STA: A2.S.5   TOP: Normal Distributions
KEY: percent

104 ANS:
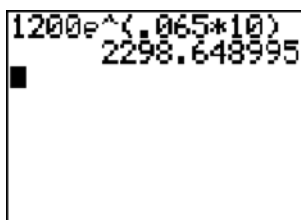
$$\frac{5(3 + \sqrt{2})}{7} \qquad \frac{5}{3 - \sqrt{2}} \times \frac{3 + \sqrt{2}}{3 + \sqrt{2}} = \frac{5(3 + \sqrt{2})}{9 - 2} = \frac{5(3 + \sqrt{2})}{7}$$

PTS: 2   REF: fall0928a2   STA: A2.N.5   TOP: Rationalizing Denominators

105 ANS: 4   PTS: 2   REF: 011111a2   STA: A2.N.8
TOP: Conjugates of Complex Numbers

106 ANS:

```
1200e^(.065*10)
         2298.648995
■
```

2,298.65.

PTS: 2   REF: fall0932a2   STA: A2.A.12   TOP: Evaluating Exponential Expressions

107 ANS: 3

$$\sqrt[3]{6a^4b^2} + \sqrt[3]{(27 \cdot 6)a^4b^2}$$

$$a\sqrt[3]{6ab^2} + 3a\sqrt[3]{6ab^2}$$

$$4a\sqrt[3]{6ab^2}$$

PTS: 2   REF: 011319a2   STA: A2.N.2   TOP: Operations with Radicals

108   ANS: 1

$$20(-2) = x(-2x + 2)$$

$$-40 = -2x^2 + 2x$$

$$2x^2 - 2x - 40 = 0$$

$$x^2 - x - 20 = 0$$

$$(x + 4)(x - 5) = 0$$

$$x = -4, 5$$

   PTS: 2   REF: 011321a2   STA: A2.A.5   TOP: Inverse Variation

109   ANS: 3

$$3x^3 - 5x^2 - 48x + 80$$

$$x^2(3x - 5) - 16(3x - 5)$$

$$(x^2 - 16)(3x - 5)$$

$$(x + 4)(x - 4)(3x - 5)$$

   PTS: 2   REF: 011317a2   STA: A2.A.7   TOP: Factoring by Grouping

110   ANS: 4   PTS: 2   REF: fall0925a2   STA: A2.S.10
   TOP: Permutations

111   ANS: 1   PTS: 2   REF: 011314a2   STA: A2.N.3
   TOP: Operations with Polynomials

112   ANS:

no solution. $\dfrac{4x}{x - 3} = 2 + \dfrac{12}{x - 3}$

$$\dfrac{4x - 12}{x - 3} = 2$$

$$\dfrac{4(x - 3)}{x - 3} = 2$$

$$4 \ne 2$$

   PTS: 2   REF: fall0930a2   STA: A2.A.23   TOP: Solving Rationals
   KEY: rational solutions

113   ANS: 2   PTS: 2   REF: 011301a2   STA: A2.A.53
   TOP: Graphing Exponential Functions

114   ANS: 3

$$\dfrac{3y}{2y - 6} + \dfrac{9}{6 - 2y} = \dfrac{3y}{2y - 6} - \dfrac{9}{2y - 6} = \dfrac{3y - 9}{2y - 6} = \dfrac{3(y - 3)}{2(y - 3)} = \dfrac{3}{2}$$

   PTS: 2   REF: 011325a2   STA: A2.A.16   TOP: Addition and Subtraction of Rationals

115 ANS: 4

$8^{3k+4} = 4^{2k-1}$.

$(2^3)^{3k+4} = (2^2)^{2k-1}$

$2^{9k+12} = 2^{4k-2}$

$9k + 12 = 4k - 2$

$5k = -14$

$k = -\dfrac{14}{5}$

PTS: 2   REF: 011309a2   STA: A2.A.27   TOP: Exponential Equations
KEY: common base not shown

116 ANS: 4

$y - 2\sin\theta = 3$

$y = 2\sin\theta + 3$

$f(\theta) = 2\sin\theta + 3$

PTS: 2   REF: fall0927a2   STA: A2.A.40   TOP: Functional Notation

117 ANS:

$y = 215.983(1.652)^x$. $215.983(1.652)^7 \approx 7250$

PTS: 4   REF: 011337a2   STA: A2.S.7   TOP: Exponential Regression

118 ANS:

$\pm\dfrac{3}{2}, -\dfrac{1}{2}$. $8x^3 + 4x^2 - 18x - 9 = 0$

$4x^2(2x+1) - 9(2x+1) = 0$

$(4x^2 - 9)(2x+1) = 0$

$4x^2 - 9 = 0$ or $2x + 1 = 0$

$(2x+3)(2x-3) = 0$ $x = -\dfrac{1}{2}$

$x = \pm\dfrac{3}{2}$

PTS: 4   REF: fall0937a2   STA: A2.A.26   TOP: Solving Polynomial Equations

119 ANS:

$16^{2x+3} = 64^{x+2}$

$(4^2)^{2x+3} = (4^3)^{x+2}$

$4x + 6 = 3x + 6$

$x = 0$

PTS: 2   REF: 011128a2   STA: A2.A.27   TOP: Exponential Equations
KEY: common base not shown

120 ANS: 4
Students entering the library are more likely to spend more time studying, creating bias.

PTS: 2 REF: fall0904a2 STA: A2.S.2 TOP: Analysis of Data

121 ANS: 4

$$_3C_2\left(\frac{5}{8}\right)^2\left(\frac{3}{8}\right)^1 = \frac{225}{512}$$

PTS: 2 REF: 011221a2 STA: A2.S.15 TOP: Binomial Probability
KEY: spinner

122 ANS:

$$\frac{2 \pm \sqrt{(-2)^2 - 4(6)(-3)}}{2(6)} = \frac{2 \pm \sqrt{76}}{12} = \frac{2 \pm \sqrt{4}\sqrt{19}}{12} = \frac{2 \pm 2\sqrt{19}}{12} = \frac{1 \pm \sqrt{19}}{6}$$

PTS: 2 REF: 011332a2 STA: A2.A.25 TOP: Quadratics with Irrational Solutions

123 ANS:

$$\frac{\sqrt{13}}{2}. \quad \sin\theta = \frac{y}{\sqrt{x^2 + y^2}} = \frac{2}{\sqrt{(-3)^2 + 2^2}} = \frac{2}{\sqrt{13}}. \quad \csc\theta = \frac{\sqrt{13}}{2}.$$

PTS: 2 REF: fall0933a2 STA: A2.A.62 TOP: Determining Trigonometric Functions

124 ANS: 1
(4) shows the strongest linear relationship, but if $r < 0$, $b < 0$. The Regents announced that a correct solution was not provided for this question and all students should be awarded credit.

PTS: 2 REF: 011223a2 STA: A2.S.8 TOP: Correlation Coefficient

125 ANS: 4 PTS: 2 REF: 011127a2 STA: A2.S.1
TOP: Analysis of Data

126 ANS: 2 PTS: 2 REF: 011222a2 STA: A2.A.39
TOP: Domain and Range KEY: real domain

127 ANS: 2

$$\frac{x^{-1} + 1}{x + 1} = \frac{\frac{1}{x} + 1}{x + 1} = \frac{\frac{1 + x}{x}}{x + 1} = \frac{1}{x}$$

PTS: 2 REF: 011211a2 STA: A2.A.9 TOP: Negative Exponents

128 ANS: 1 PTS: 2 REF: 011320a2 STA: A2.A.72
TOP: Identifying the Equation of a Trigonometric Graph

129 ANS: 2 PTS: 2 REF: 011213a2 STA: A2.N.8
TOP: Conjugates of Complex Numbers

130 ANS: 3

$$3x^5 - 48x = 0$$

$$3x(x^4 - 16) = 0$$

$$3x(x^2 + 4)(x^2 - 4) = 0$$

$$3x(x^2 + 4)(x + 2)(x - 2) = 0$$

PTS: 2   REF: 011216a2   STA: A2.A.26   TOP: Solving Polynomial Equations

131 ANS:
$-3, -5, -8, -12$

PTS: 2   REF: fall0934a2   STA: A2.A.33   TOP: Recursive Sequences

132 ANS: 4   PTS: 2   REF: fall0908a2   STA: A2.A.38
TOP: Defining Functions   KEY: graphs

133 ANS: 2   PTS: 2   REF: 011126a2   STA: A2.A.49
TOP: Equations of Circles

134 ANS: 3

$$42 = \frac{1}{2}(a)(8)\sin 61$$

$$42 \approx 3.5a$$

$$12 \approx a$$

PTS: 2   REF: 011316a2   STA: A2.A.74   TOP: Using Trigonometry to Find Area
KEY: basic

135 ANS:

7. $4 - \sqrt{2x - 5} = 1$

$$-\sqrt{2x - 5} = -3$$

$$2x - 5 = 9$$

$$2x = 14$$

$$x = 7$$

PTS: 2   REF: 011229a2   STA: A2.A.22   TOP: Solving Radicals
KEY: basic

136 ANS:

101.43, 12.

$r^2 = 25^2 + 85^2 - 2(25)(85)\cos 125.$

$r^2 \approx 10287.7$
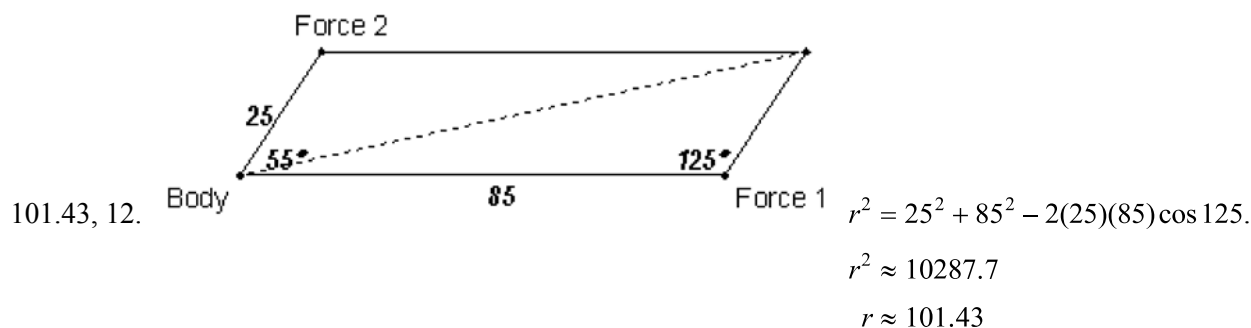
$r \approx 101.43$

$\dfrac{2.5}{\sin x} = \dfrac{101.43}{\sin 125}$

$x \approx 12$

PTS: 6　　　REF: fall0939a2　　STA: A2.A.73　　TOP: Vectors

137 ANS: 3

$S_n = \dfrac{n}{2}[2a + (n-1)d] = \dfrac{19}{2}[2(3) + (19-1)7] = 1254$

PTS: 2　　　REF: 011202a2　　STA: A2.A.35　　TOP: Summations
KEY: arithmetic

138 ANS: 4

$4ab\sqrt{2b} - 3a\sqrt{9b^2}\sqrt{2b} + 7ab\sqrt{6b} = 4ab\sqrt{2b} - 9ab\sqrt{2b} + 7ab\sqrt{6b} = -5ab\sqrt{2b} + 7ab\sqrt{6b}$

PTS: 2　　　REF: fall0918a2　　STA: A2.A.14　　TOP: Operations with Radicals
KEY: with variables | index = 2

139 ANS:

$\dfrac{12}{\sin 32} = \dfrac{10}{\sin B}$　　　. $C \approx 180 - (32 + 26.2) \approx 121.8.$　$\dfrac{12}{\sin 32} = \dfrac{c}{\sin 121.8}$

$B = \sin^{-1} \dfrac{10\sin 32}{12} \approx 26.2$　　　　$c = \dfrac{12\sin 121.8}{\sin 32} \approx 19.2$

PTS: 4　　　REF: 011137a2　　STA: A2.A.73　　TOP: Law of Sines
KEY: basic

140 ANS: 1　　　PTS: 2　　　REF: 011313a2　　STA: A2.A.39
TOP: Domain and Range　　　　KEY: real domain

141 ANS: 4

$\cos 2A = 1 - 2\sin^2 A = 1 - 2\left(\dfrac{1}{3}\right)^2 = 1 - \dfrac{2}{9} = \dfrac{7}{9}$

PTS: 2　　　REF: 011311a2　　STA: A2.A.77　　TOP: Double Angle Identities
KEY: evaluating

142 ANS: 4　　　PTS: 1　　　REF: 011312a2　　STA: A2.A.56
TOP: Determining Trigonometric Functions　　　　KEY: degrees, common angles

143 ANS:

$$\frac{-2(x^2+6)}{x^4} \cdot \frac{x^2(x-3)+6(x-3)}{x^2-4x} \cdot \frac{2x-4}{x^4-3x^3} \div \frac{x^2+2x-8}{16-x^2}$$

$$\frac{(x^2+6)(x-3)}{x(x-4)} \cdot \frac{2(x-2)}{x^3(x-3)} \cdot \frac{(4+x)(4-x)}{(x+4)(x-2)}$$

$$\frac{-2(x^2+6)}{x^4}$$

PTS: 6   REF: 011239a2   STA: A2.A.16   TOP: Multiplication and Division of Rationals
KEY: division

144 ANS: 1

$$\cos(A-B) = \left(\frac{5}{13}\right)\left(-\frac{3}{5}\right) + \left(\frac{12}{13}\right)\left(\frac{4}{5}\right) = -\frac{15}{65} + \frac{48}{65} = \frac{33}{65}$$

PTS: 2   REF: 011214a2   STA: A2.A.76   TOP: Angle Sum and Difference Identities
KEY: evaluating

145 ANS: 3   PTS: 2   REF: 011119a2   STA: A2.A.52
TOP: Families of Functions

146 ANS:

$$\frac{\sin^2 A}{\cos^2 A} + \frac{\cos^2 A}{\cos^2 A} = \frac{1}{\cos^2 A}$$

$$\tan^2 A + 1 = \sec^2 A$$

PTS: 2   REF: 011135a2   STA: A2.A.67   TOP: Proving Trigonometric Identities

147 ANS: 3

```
1-Var Stats L1,L   σx²
2                     67.31102041
```

PTS: 2   REF: fall0924a2   STA: A2.S.4   TOP: Dispersion
KEY: range, quartiles, interquartile range, variance

148 ANS: 4   PTS: 2   REF: 011124a2   STA: A2.A.18
TOP: Evaluating Logarithmic Expressions

149 ANS:

230. $10 + (1^3 - 1) + (2^3 - 1) + (3^3 - 1) + (4^3 - 1) + (5^3 - 1) = 10 + 0 + 7 + 26 + 63 + 124 = 230$

PTS: 2   REF: 011131a2   STA: A2.N.10   TOP: Sigma Notation
KEY: basic

150 ANS: 2
Since the coefficient of t is greater than 0, $r > 0$.

PTS: 2 REF: 011303a2 STA: A2.S.8 TOP: Correlation Coefficient
151 ANS: 4
$6x - x^3 - x^2 = -x(x^2 + x - 6) = -x(x + 3)(x - 2)$

PTS: 2 REF: fall0917a2 STA: A2.A.7 TOP: Factoring Polynomials
KEY: single variable
152 ANS: 3
$f(4) = \dfrac{1}{2}(4) - 3 = -1$. $g(-1) = 2(-1) + 5 = 3$

PTS: 2 REF: fall0902a2 STA: A2.A.42 TOP: Compositions of Functions
KEY: numbers
153 ANS: 3
$S = \dfrac{-b}{a} = \dfrac{-(-3)}{4} = \dfrac{3}{4}$. $P = \dfrac{c}{a} = \dfrac{-8}{4} = -2$

PTS: 2 REF: fall0912a2 STA: A2.A.21 TOP: Roots of Quadratics
KEY: basic
154 ANS: 2
$6(x^2 - 5) = 6x^2 - 30$

PTS: 2 REF: 011109a2 STA: A2.A.42 TOP: Compositions of Functions
KEY: variables
155 ANS: 1
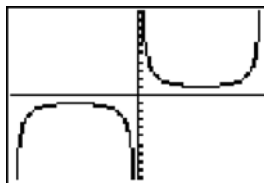
PTS: 2 REF: 011123a2 STA: A2.A.71 TOP: Graphing Trigonometric Functions
156 ANS: 4 PTS: 2 REF: 011323a2 STA: A2.A.2
TOP: Using the Discriminant KEY: determine nature of roots given equation

Algebra 2/Trigonometry Regents at Random
Answer Section

157 ANS:

$$\frac{\cot x \sin x}{\sec x} = \frac{\frac{\cos x}{\sin x} \cdot \sin x}{\frac{1}{\cos x}} = \cos^2 x$$

PTS: 2 REF: 061334a2 STA: A2.A.58 TOP: Reciprocal Trigonometric Relationships

158 ANS: 2

$2^2 \cdot 3 = 12$. $6^2 d = 12$

$4^2 \cdot \frac{3}{4} = 12$ $\quad 36d = 12$

$\quad\quad\quad\quad d = \frac{1}{3}$

PTS: 2 REF: 061310a2 STA: A2.A.5 TOP: Inverse Variation

159 ANS: 2

$$\frac{11\pi}{12} \cdot \frac{180}{\pi} = 165$$

PTS: 2 REF: 061002a2 STA: A2.M.2 TOP: Radian Measure
KEY: degrees

160 ANS: 1 PTS: 2 REF: 061210a2 STA: A2.A.9
TOP: Negative Exponents

161 ANS: 1

$y \geq x^2 - x - 6$

$y \geq (x - 3)(x + 2)$

PTS: 2 REF: 061017a2 STA: A2.A.4 TOP: Quadratic Inequalities
KEY: two variables

162 ANS:

$a_1 = 3$. $a_2 = 2(3) - 1 = 5$. $a_3 = 2(5) - 1 = 9$.

PTS: 2 REF: 061233a2 STA: A2.A.33 TOP: Recursive Sequences

163 ANS:

$$\frac{\sqrt{3}}{2} \times \frac{\sqrt{2}}{2} = \frac{\sqrt{6}}{4}$$

PTS: 2 REF: 061331a2 STA: A2.A.56 TOP: Determining Trigonometric Functions
KEY: degrees, common angles

164 ANS: 3

$$s = \theta r = \frac{2\pi}{8} \cdot 6 = \frac{3\pi}{2}$$

PTS: 2 REF: 061212a2 STA: A2.A.61 TOP: Arc Length
KEY: arc length

165 ANS: 1

$5x + 29 = (x + 3)^2$. $(-5) + 3$ shows an extraneous solution.

$5x + 29 = x^2 + 6x + 9$

$\quad 0 = x^2 + x - 20$

$\quad 0 = (x + 5)(x - 4)$

$\quad x = -5, 4$

PTS: 2 REF: 061213a2 STA: A2.A.22 TOP: Solving Radicals
KEY: extraneous solutions

166 ANS: 3

$$\frac{\sin^2 \theta + \cos^2 \theta}{1 - \sin^2 \theta} = \frac{1}{\cos^2 \theta} = \sec^2 \theta$$

PTS: 2 REF: 061123a2 STA: A2.A.58 TOP: Reciprocal Trigonometric Relationships
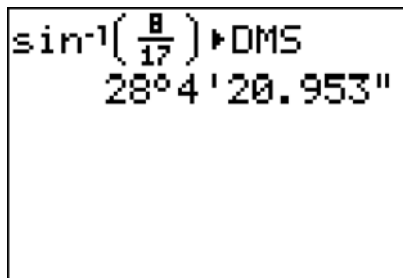
167 ANS: 4 PTS: 2 REF: 061206a2 STA: A2.A.60
TOP: Unit Circle

168 ANS: 1 PTS: 2 REF: 061018a2 STA: A2.A.22
TOP: Solving Radicals KEY: extraneous solutions

169 ANS: 2

$\sin S = \dfrac{8}{17}$

$\quad S = \sin^{-1} \dfrac{8}{17}$

$\quad S \approx 28°4'$

PTS: 2 REF: 061311a2 STA: A2.A.55 TOP: Trigonometric Ratios

170 ANS: 4

$$\frac{x}{x - \sqrt{x}} \times \frac{x + \sqrt{x}}{x + \sqrt{x}} = \frac{x^2 + x\sqrt{x}}{x^2 - x} = \frac{x(x + \sqrt{x})}{x(x - 1)} = \frac{x + \sqrt{x}}{x - 1}$$

PTS: 2 REF: 061325a2 STA: A2.A.15 TOP: Rationalizing Denominators
KEY: index = 2

171 ANS: 3
Cofunctions tangent and cotangent are complementary

PTS: 2   REF: 061014a2   STA: A2.A.58   TOP: Cofunction Trigonometric Relationships

172 ANS: 4

$$S_n = \frac{n}{2}[2a + (n-1)d] = \frac{21}{2}[2(18) + (21-1)2] = 798$$

PTS: 2   REF: 061103a2   STA: A2.A.35   TOP: Series
KEY: arithmetic

173 ANS:

$\sin(45 + 30) = \sin 45 \cos 30 + \cos 45 \sin 30$

$$= \frac{\sqrt{2}}{2} \cdot \frac{\sqrt{3}}{2} + \frac{\sqrt{2}}{2} \cdot \frac{1}{2} = \frac{\sqrt{6}}{4} + \frac{\sqrt{2}}{4} = \frac{\sqrt{6} + \sqrt{2}}{4}$$

PTS: 4   REF: 061136a2   STA: A2.A.76   TOP: Angle Sum and Difference Identities
KEY: evaluating

174 ANS:
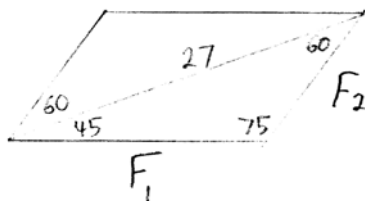
$$\frac{27}{\sin 75} = \frac{F_1}{\sin 60} . \quad \frac{27}{\sin 75} = \frac{F_2}{\sin 45} .$$

$$F_1 \approx 24 \qquad F_1 \approx 20$$

PTS: 4   REF: 061238a2   STA: A2.A.73   TOP: Vectors

175 ANS:

$$2x - 1 = 27^{\frac{4}{3}}$$
$$2x - 1 = 81$$
$$2x = 82$$
$$x = 41$$

PTS: 2   REF: 061329a2   STA: A2.A.28   TOP: Logarithmic Equations
KEY: advanced

176 ANS: 3
$$\sqrt{-300} = \sqrt{100}\sqrt{-1}\sqrt{3}$$

PTS: 2   REF: 061006a2   STA: A2.N.6   TOP: Square Roots of Negative Numbers

177 ANS: 3

$$\frac{3^{-2}}{(-2)^{-3}} = \frac{\frac{1}{9}}{-\frac{1}{8}} = -\frac{8}{9}$$

PTS: 2   REF: 061003a2   STA: A2.N.1   TOP: Negative and Fractional Exponents

178 ANS: 3   PTS: 2   REF: 061022a2   STA: A2.A.63
TOP: Domain and Range

179 ANS:

$y = 180.377(0.954)^x$

PTS: 2   REF: 061231a2   STA: A2.S.7   TOP: Exponential Regression

180 ANS: 1   PTS: 2   REF: 061202a2   STA: A2.A.51
TOP: Domain and Range

181 ANS: 1
$2x - 1 > 5.$ $2x - 1 < -5$

  $2x > 6$ $2x > -4$

  $x > 3$ $x < -2$

PTS: 2   REF: 061307a2   STA: A2.A.1   TOP: Absolute Value Inequalities
KEY: graph

182 ANS: 3
$3x + 16 = (x + 2)^2$. −4 is an extraneous solution.

$3x + 16 = x^2 + 4x + 4$

  $0 = x^2 + x - 12$

  $0 = (x + 4)(x - 3)$

  $x = -4$ $x = 3$

PTS: 2   REF: 061121a2   STA: A2.A.22   TOP: Solving Radicals
KEY: extraneous solutions

183 ANS:

$$\frac{_{10}P_{10}}{3!\cdot 3!\cdot 2!} = \frac{3,628,800}{72} = 50,400$$

PTS: 2   REF: 061330a2   STA: A2.S.10   TOP: Permutations

184 ANS:

$$6y^3 - \frac{37}{10}y^2 - \frac{1}{5}y. \ \left(\frac{1}{2}y^2 - \frac{1}{3}y\right)\left(12y + \frac{3}{5}\right) = 6y^3 + \frac{3}{10}y^2 - 4y^2 - \frac{1}{5}y = 6y^3 - \frac{37}{10}y^2 - \frac{1}{5}y$$

PTS: 2   REF: 061128a2   STA: A2.N.3   TOP: Operations with Polynomials

185 ANS:

No. TENNESSEE: $\dfrac{{}_9P_9}{4!\cdot 2!\cdot 2!} = \dfrac{362,880}{96} = 3,780.$ VERMONT: ${}_7P_7 = 5,040$

PTS: 4 REF: 061038a2 STA: A2.S.10 TOP: Permutations
186 ANS: 1 PTS: 2 REF: 061025a2 STA: A2.A.34
TOP: Sigma Notation
187 ANS: 3 PTS: 2 REF: 061308ge STA: A2.A.51
TOP: Domain and Range
188 ANS:
$y = -3\sin 2x.$ The period of the function is π, the amplitude is 3 and it is reflected over the *x*-axis.

PTS: 2 REF: 061235a2 STA: A2.A.72
TOP: Identifying the Equation of a Trigonometric Graph
189 ANS: 3 PTS: 2 REF: 061224a2 STA: A2.A.63
TOP: Domain and Range
190 ANS:

$-\dfrac{\sqrt{3}}{2}$
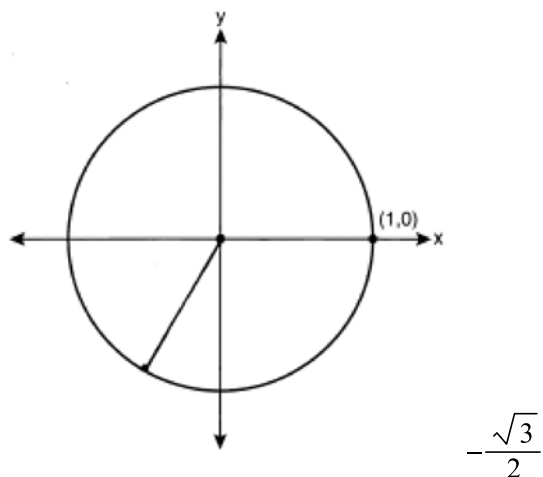
PTS: 2 REF: 061033a2 STA: A2.A.60 TOP: Unit Circle
191 ANS: 1 PTS: 2 REF: 061013a2 STA: A2.A.38
TOP: Defining Functions
192 ANS: 1
$\cos^2\theta - \cos 2\theta = \cos^2\theta - (\cos^2\theta - \sin^2\theta) = \sin^2\theta$

PTS: 2 REF: 061024a2 STA: A2.A.77 TOP: Double Angle Identities
KEY: simplifying
193 ANS:
$g(10) = \left(a(10)\sqrt{1-x} \right)^2 = 100a^2(-9) = -900a^2$

PTS: 2 REF: 061333a2 STA: A2.A.41 TOP: Functional Notation
194 ANS: 4 PTS: 2 REF: 061026a2 STA: A2.A.29
TOP: Sequences

195 ANS: 3

$6n^{-1} < 4n^{-1}$. Flip sign when multiplying each side of the inequality by n, since a negative number.

$\dfrac{6}{n} < \dfrac{4}{n}$

$6 > 4$

PTS: 2   REF: 061314a2   STA: A2.N.1   TOP: Negative and Fractional Exponents

196 ANS: 3

$x = 5^4 = 625$

PTS: 2   REF: 061106a2   STA: A2.A.28   TOP: Logarithmic Equations
KEY: basic

197 ANS: 1

If $\sin x = 0.8$, then $\cos x = 0.6$. $\tan \dfrac{1}{2} x = \sqrt{\dfrac{1 - 0.6}{1 + 0.6}} = \sqrt{\dfrac{0.4}{1.6}} = 0.5$.

PTS: 2   REF: 061220a2   STA: A2.A.77   TOP: Half Angle Identities

198 ANS: 3   PTS: 2   REF: 081007a2   STA: A2.A.64
TOP: Using Inverse Trigonometric Functions   KEY: basic

199 ANS:

Sum $\dfrac{-b}{a} = -\dfrac{11}{5}$. Product $\dfrac{c}{a} = -\dfrac{3}{5}$

PTS: 2   REF: 061030a2   STA: A2.A.20   TOP: Roots of Quadratics

200 ANS:

$e^{3\ln 2} = e^{\ln 2^3} = e^{\ln 8} = 8$

PTS: 2   REF: 061131a2   STA: A2.A.12   TOP: Evaluating Exponential Expressions

201 ANS: 2

$x^2 - 2x + y^2 + 6y = -3$

$x^2 - 2x + 1 + y^2 + 6y + 9 = -3 + 1 + 9$

$(x - 1)^2 + (y + 3)^2 = 7$

PTS: 2   REF: 061016a2   STA: A2.A.47   TOP: Equations of Circles

202 ANS: 3   PTS: 2   REF: 081027a2   STA: A2.A.44
TOP: Inverse of Functions   KEY: equations

203 ANS: 3   PTS: 2   REF: 061119a2   STA: A2.A.65
TOP: Graphing Trigonometric Functions

204 ANS: 1

$2\log x - (3\log y + \log z) = \log x^2 - \log y^3 - \log z = \log \dfrac{x^2}{y^3 z}$

PTS: 2   REF: 061010a2   STA: A2.A.19   TOP: Properties of Logarithms

205 ANS: 3 PTS: 2 REF: 061306a2 STA: A2.A.72
TOP: Identifying the Equation of a Trigonometric Graph

206 ANS: 3

$$\frac{59.2}{\sin 74} = \frac{60.3}{\sin C} \quad 180 - 78.3 = 101.7$$

$$C \approx 78.3$$

PTS: 2 REF: 081006a2 STA: A2.A.75 TOP: Law of Sines - The Ambiguous Case

207 ANS:

$$y = 10.596(1.586)^x$$

PTS: 2 REF: 081031a2 STA: A2.S.7 TOP: Exponential Regression

208 ANS:

$$\frac{23}{2} \qquad \cos^2 B + \sin^2 B = 1 \qquad \tan B = \frac{\sin B}{\cos B} = \frac{\dfrac{5}{\sqrt{41}}}{\dfrac{4}{\sqrt{41}}} = \frac{5}{4}$$

$$\cos^2 B + \left(\frac{5}{\sqrt{41}}\right)^2 = 1$$

$$\cos^2 B + \frac{25}{41} = \frac{41}{41}$$

$$\cos^2 B = \frac{16}{41}$$

$$\cos B = \frac{4}{\sqrt{41}}$$

$$\tan(A+B) = \frac{\dfrac{2}{3} + \dfrac{5}{4}}{1 - \left(\dfrac{2}{3}\right)\left(\dfrac{5}{4}\right)} = \frac{\dfrac{8+15}{12}}{\dfrac{12}{12} - \dfrac{10}{12}} = \frac{\dfrac{23}{12}}{\dfrac{2}{12}} = \frac{23}{2}$$

PTS: 4 REF: 081037a2 STA: A2.A.76 TOP: Angle Sum and Difference Identities
KEY: evaluating

209 ANS: 4

$$b^2 - 4ac = 3^2 - 4(9)(-4) = 9 + 144 = 153$$

PTS: 2 REF: 081016a2 STA: A2.A.2 TOP: Using the Discriminant
KEY: determine nature of roots given equation

210 ANS: 3

$$27r^{4-1} = 64$$

$$r^3 = \frac{64}{27}$$

$$r = \frac{4}{3}$$

PTS: 2 REF: 081025a2 STA: A2.A.31 TOP: Sequences

211 ANS:

$$K = ab\sin C = 18 \cdot 22\sin 60 = 396\frac{\sqrt{3}}{2} = 198\sqrt{3}$$

PTS: 2   REF: 061234a2   STA: A2.A.74   TOP: Using Trigonometry to Find Area
KEY: Parallelograms

212 ANS: 3
$K = (10)(18)\sin 46 \approx 129$

PTS: 2   REF: 081021a2   STA: A2.A.74   TOP: Using Trigonometry to Find Area
KEY: parallelograms

213 ANS: 1

$$\frac{\sqrt{3}+5}{\sqrt{3}-5} \cdot \frac{\sqrt{3}+5}{\sqrt{3}+5} = \frac{3+5\sqrt{3}+5\sqrt{3}+25}{3-25} = \frac{28+10\sqrt{3}}{-22} = -\frac{14+5\sqrt{3}}{11}$$

PTS: 2   REF: 061012a2   STA: A2.N.5   TOP: Rationalizing Denominators

214 ANS: 2   PTS: 2   REF: 061205a2   STA: A2.A.34
TOP: Sigma Notation

215 ANS: 4   PTS: 2   REF: 061303a2   STA: A2.A.43
TOP: Defining Functions

216 ANS:

$$5\sqrt{3x^3} - 2\sqrt{27x^3} = 5\sqrt{x^2}\sqrt{3x} - 2\sqrt{9x^2}\sqrt{3x} = 5x\sqrt{3x} - 6x\sqrt{3x} = -x\sqrt{3x}$$

PTS: 2   REF: 061032a2   STA: A2.N.2   TOP: Operations with Radicals

217 ANS: 1   PTS: 2   REF: 061317a2   STA: A2.S.9
TOP: Differentiating Permutations and Combinations

218 ANS: 2

$$\frac{-\frac{3}{32}a^3b^4}{\frac{1}{64}a^5b^3} = -\frac{6b}{a^2}$$

PTS: 2   REF: 061326a2   STA: A2.A.31   TOP: Sequences

219 ANS:
Controlled experiment because Howard is comparing the results obtained from an experimental sample against a control sample.

PTS: 2   REF: 081030a2   STA: A2.S.1   TOP: Analysis of Data

220 ANS: 3
(1) and (4) fail the horizontal line test and are not one-to-one. Not every element of the range corresponds to only one element of the domain. (2) fails the vertical line test and is not a function. Not every element of the domain corresponds to only one element of the range.

PTS: 2   REF: 081020a2   STA: A2.A.43   TOP: Defining Functions

221 ANS: 4
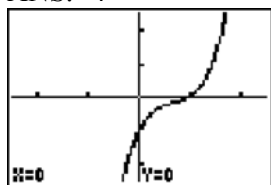
PTS: 2　　　　　REF: 061222a2　　STA: A2.A.50　　TOP: Solving Polynomial Equations

222 ANS: 1

$_9C_3a^6(-4b)^3 = -5376a^6b^3$

PTS: 2　　　　　REF: 061126a2　　STA: A2.A.36　　TOP: Binomial Expansions

223 ANS: 4　　　　　PTS: 2　　　　　REF: 061120a2　　STA: A2.A.19
TOP: Properties of Logarithms　　　　KEY: splitting logs

224 ANS: 2

$$\frac{x^{-1}-1}{x-1} = \frac{\frac{1}{x}-1}{x-1} = \frac{\frac{1-x}{x}}{x-1} = \frac{\frac{-(x-1)}{x}}{x-1} = -\frac{1}{x}$$

PTS: 2　　　　　REF: 081018a2　　STA: A2.A.9　　TOP: Negative Exponents

225 ANS:

$$\frac{15}{\sin 103} = \frac{a}{\sin 42}. \quad \frac{1}{2}(15)(10.3)\sin 35 \approx 44$$

$$a \approx 10.3$$

PTS: 4　　　　　REF: 061337a2　　STA: A2.A.74　　TOP: Using Trigonometry to Find Area
KEY: advanced

226 ANS:

$$\frac{12x^2}{y^9} \cdot \frac{3x^{-4}y^5}{(2x^3y^{-7})^{-2}} = \frac{3y^5(2x^3y^{-7})^2}{x^4} = \frac{3y^5(4x^6y^{-14})}{x^4} = \frac{12x^6y^{-9}}{x^4} = \frac{12x^2}{y^9}$$

PTS: 2　　　　　REF: 061134a2　　STA: A2.A.9　　TOP: Negative Exponents

227 ANS:

$(x+5)^2 + (y-3)^2 = 32$

PTS: 2　　　　　REF: 081033a2　　STA: A2.A.49　　TOP: Writing Equations of Circles

228 ANS: 4　　　　　PTS: 2　　　　　REF: 061207a2　　STA: A2.A.19
TOP: Properties of Logarithms　　　　KEY: antilogarithms

229 ANS: 1

n	3	4	5	Σ
$-r^2 + r$	$-3^2 + 3 = -6$	$-4^2 + 4 = -12$	$-5^2 + 5 = -20$	-38

PTS: 2　　　　　REF: 061118a2　　STA: A2.N.10　　TOP: Sigma Notation
KEY: basic

230 ANS:

Sum $\dfrac{-b}{a} = -\dfrac{1}{12}$. Product $\dfrac{c}{a} = -\dfrac{1}{2}$

PTS: 2   REF: 061328a2   STA: A2.A.20   TOP: Roots of Quadratics

231 ANS: 1

$a_n = -\sqrt{5}(-\sqrt{2})^{n-1}$

$a_{15} = -\sqrt{5}(-\sqrt{2})^{15-1} = -\sqrt{5}(-\sqrt{2})^{14} = -\sqrt{5} \cdot 2^7 = -128\sqrt{5}$

PTS: 2   REF: 061109a2   STA: A2.A.32   TOP: Sequences

232 ANS: 4   PTS: 2   REF: 061124a2   STA: A2.S.3

    TOP: Average Known with Missing Data

233 ANS: 2   PTS: 2   REF: 061011a2   STA: A2.A.10

    TOP: Fractional Exponents as Radicals

234 ANS:

no. over 20 is more than 1 standard deviation above the mean. $0.159 \cdot 82 \approx 13.038$

PTS: 2   REF: 061129a2   STA: A2.S.5   TOP: Normal Distributions

KEY: predict

235 ANS: 4   PTS: 2   REF: 061101a2   STA: A2.S.1

    TOP: Analysis of Data

236 ANS:

$$_7C_3\left(\frac{1}{4}\right)^3\left(\frac{3}{4}\right)^4 = 35\left(\frac{1}{64}\right)\left(\frac{81}{256}\right) = \frac{2835}{16384} \approx 0.173$$

PTS: 2   REF: 061335a2   STA: A2.S.15   TOP: Binomial Probability

KEY: exactly

237 ANS:

$K = ab\sin C = 24 \cdot 30 \sin 57 \approx 604$

PTS: 2   REF: 061034a2   STA: A2.A.74   TOP: Using Trigonometry to Find Area

KEY: parallelograms

238 ANS: 1

$$\frac{6}{\sin 35} = \frac{10}{\sin N}$$

$$N \approx 73$$

$$73 + 35 < 180$$

$$(180 - 73) + 35 < 180$$

PTS: 2   REF: 061226a2   STA: A2.A.75   TOP: Law of Sines - The Ambiguous Case

239 ANS:

$$\frac{51}{243} \cdot {}_5C_3\left(\frac{1}{3}\right)^3\left(\frac{2}{3}\right)^2 = \frac{40}{243}$$

$${}_5C_4\left(\frac{1}{3}\right)^4\left(\frac{2}{3}\right)^1 = \frac{10}{243}$$

$${}_5C_3\left(\frac{1}{3}\right)^5\left(\frac{2}{3}\right)^0 = \frac{1}{243}$$

PTS: 4   REF: 061138a2   STA: A2.S.15   TOP: Binomial Probability
KEY: at least or at most

240 ANS: 1
The binomials are conjugates, so use FL.

PTS: 2   REF: 061201a2   STA: A2.N.3   TOP: Operations with Polynomials

241 ANS: 2

$$\frac{8\pi}{5} \cdot \frac{180}{\pi} = 288$$

PTS: 2   REF: 061302a2   STA: A2.M.2   TOP: Radian Measure
KEY: degrees

242 ANS: 2
The roots are $-1, 2, 3$.

PTS: 2   REF: 081023a2   STA: A2.A.50   TOP: Solving Polynomial Equations

243 ANS: 3   PTS: 2   REF: 061114a2   STA: A2.A.38
TOP: Defining Functions   KEY: graphs

244 ANS: 3   PTS: 2   REF: 061007a2   STA: A2.S.9
TOP: Differentiating Permutations and Combinations

245 ANS: 4
$\sin(\theta + 90) = \sin\theta \cdot \cos 90 + \cos\theta \cdot \sin 90 = \sin\theta \cdot (0) + \cos\theta \cdot (1) = \cos\theta$

PTS: 2   REF: 061309a2   STA: A2.A.76   TOP: Angle Sum and Difference Identities
KEY: identities

246 ANS: 2   PTS: 2   REF: 061218a2   STA: A2.A.43
TOP: Defining Functions

247 ANS: 2
${}_{15}C_8 = 6,435$

PTS: 2   REF: 081012a2   STA: A2.S.11   TOP: Combinations

248 ANS:

$$\sum_{n=1}^{15} 7n$$

PTS: 2   REF: 081029a2   STA: A2.A.34   TOP: Sigma Notation

249 ANS:

$A = 750e^{(0.03)(8)} \approx 953$

PTS: 2   REF: 061229a2   STA: A2.A.12   TOP: Evaluating Exponential Expressions

250 ANS: 1

$\sqrt[4]{16x^2y^7} = 16^{\frac{1}{4}} x^{\frac{2}{4}} y^{\frac{7}{4}} = 2x^{\frac{1}{2}} y^{\frac{7}{4}}$

PTS: 2   REF: 061107a2   STA: A2.A.11   TOP: Radicals as Fractional Exponents

251 ANS:

33. $a = \sqrt{10^2 + 6^2 - 2(10)(6)\cos 80} \approx 10.7.$ $\angle C$ is opposite the shortest side. $\dfrac{6}{\sin C} = \dfrac{10.7}{\sin 80}$

$C \approx 33$

PTS: 6   REF: 061039a2   STA: A2.A.73   TOP: Law of Cosines
KEY: advanced

252 ANS:

$\dfrac{4}{9}x^2 - \dfrac{4}{3}x + 1. \ \left(\dfrac{2}{3}x - 1\right)^2 = \left(\dfrac{2}{3}x - 1\right)\left(\dfrac{2}{3}x - 1\right) = \dfrac{4}{9}x^2 - \dfrac{2}{3}x - \dfrac{2}{3}x + 1 = \dfrac{4}{9}x^2 - \dfrac{4}{3}x + 1$

PTS: 2   REF: 081034a2   STA: A2.N.3   TOP: Operations with Polynomials

253 ANS:

$\dfrac{13}{x} = 10 - x \qquad .\ x = \dfrac{10 \pm \sqrt{100 - 4(1)(13)}}{2(1)} = \dfrac{10 \pm \sqrt{48}}{2} = \dfrac{10 \pm 4\sqrt{3}}{2} = 5 \pm 2\sqrt{3}$

$13 = 10x - x^2$

$x^2 - 10x + 13 = 0$

PTS: 4   REF: 061336a2   STA: A2.A.23   TOP: Solving Rationals
KEY: irrational and complex solutions

254 ANS: 2

$\dfrac{2\pi}{b} = \dfrac{2\pi}{3}$

PTS: 2   REF: 061111a2   STA: A2.A.69
TOP: Properties of Graphs of Trigonometric Functions   KEY: period

255 ANS: 2

$x^2 - x - 6 = 3x - 6$

$x^2 - 4x = 0$

$x(x - 4) = 0$

$x = 0, 4$

PTS: 2   REF: 081015a2   STA: A2.A.3   TOP: Quadratic-Linear Systems
KEY: equations

256 ANS: 1   PTS: 2   REF: 061324a2   STA: A2.A.9
TOP: Negative Exponents

257 ANS: 3

$(3i)(2i)^2(m + i)$

$(3i)(4i^2)(m + i)$

$(3i)(-4)(m + i)$

$(-12i)(m + i)$

$-12mi - 12i^2$

$-12mi + 12$

PTS: 2   REF: 061319a2   STA: A2.N.9
TOP: Multiplication and Division of Complex Numbers

258 ANS: 3

$$\frac{4}{5 - \sqrt{13}} \cdot \frac{5 + \sqrt{13}}{5 + \sqrt{13}} = \frac{4(5 + \sqrt{13})}{25 - 13} = \frac{5 + \sqrt{13}}{3}$$

PTS: 2   REF: 061116a2   STA: A2.N.5   TOP: Rationalizing Denominators

259 ANS: 2

$$\tan 30 = \frac{\sqrt{3}}{3}. \quad \text{Arc}\cos \frac{\sqrt{3}}{k} = 30$$

$$\frac{\sqrt{3}}{k} = \cos 30$$

$$k = 2$$

PTS: 2   REF: 061323a2   STA: A2.A.64   TOP: Using Inverse Trigonometric Functions
KEY: advanced

260 ANS: 2   PTS: 2   REF: 061301a2   STA: A2.S.1
TOP: Analysis of Data

261 ANS:
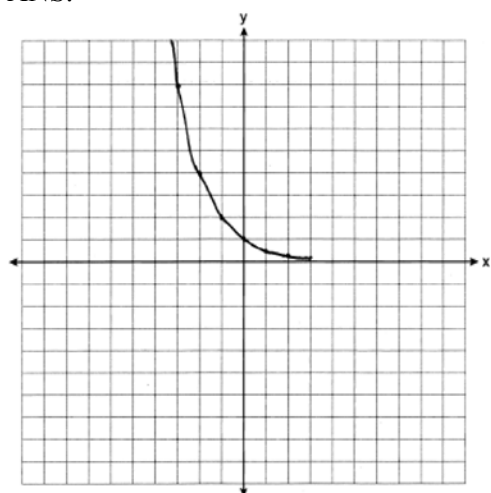
$y = 0$

　　PTS: 2　　　　　REF: 061031a2　　STA: A2.A.53　　TOP: Graphing Exponential Functions

262 ANS: 3　　　　　PTS: 2　　　　REF: 061219a2　　STA: A2.N.8

　　TOP: Conjugates of Complex Numbers

263 ANS:

$$b^2 - 4ac = 0$$

$$k^2 - 4(1)(4) = 0$$

$$k^2 - 16 = 0$$

$$(k + 4)(k - 4) = 0$$

$$k = \pm 4$$

　　PTS: 2　　　　　REF: 061028a2　　STA: A2.A.2　　　TOP: Using the Discriminant

　　KEY: determine equation given nature of roots

264 ANS:

　　45, 225　$2\tan C - 3 = 3\tan C - 4$

$$1 = \tan C$$

$$\tan^{-1} 1 = C$$

$$C = 45, 225$$

　　PTS: 2　　　　　REF: 081032a2　　STA: A2.A.68　　TOP: Trigonometric Equations

　　KEY: basic

265 ANS: 4

$$(3 + \sqrt{5})(3 - \sqrt{5}) = 9 - \sqrt{25} = 4$$

　　PTS: 2　　　　　REF: 081001a2　　STA: A2.N.4　　TOP: Operations with Irrational Expressions

　　KEY: without variables | index = 2

266 ANS: 2　　　　　PTS: 2　　　　REF: 061216a2　　STA: A2.A.42

　　TOP: Compositions of Functions　　　KEY: variables

14

267 ANS: 4

$12x^4 + 10x^3 - 12x^2 = 2x^2(6x^2 + 5x - 6) = 2x^2(2x + 3)(3x - 2)$

PTS: 2   REF: 061008a2   STA: A2.A.7   TOP: Factoring Polynomials
KEY: single variable

268 ANS: 1   PTS: 2   REF: 081022a2   STA: A2.A.46
TOP: Transformations with Functions and Relations

269 ANS:

$x = -\dfrac{1}{3}, -1$ $\log_{x+3}\dfrac{x^3 + x - 2}{x} = 2$

$$\dfrac{x^3 + x - 2}{x} = (x + 3)^2$$

$$\dfrac{x^3 + x - 2}{x} = x^2 + 6x + 9$$

$$x^3 + x - 2 = x^3 + 6x^2 + 9x$$

$$0 = 6x^2 + 8x + 2$$

$$0 = 3x^2 + 4x + 1$$

$$0 = (3x + 1)(x + 1)$$

$$x = -\dfrac{1}{3}, -1$$

PTS: 6   REF: 081039a2   STA: A2.A.28   TOP: Logarithmic Equations
KEY: basic

270 ANS: 2
$\cos(-305° + 360°) = \cos(55°)$

PTS: 2   REF: 061104a2   STA: A2.A.57   TOP: Reference Angles

271 ANS:
$10ax^2 - 23ax - 5a = a(10x^2 - 23x - 5) = a(5x + 1)(2x - 5)$

PTS: 2   REF: 081028a2   STA: A2.A.7   TOP: Factoring Polynomials
KEY: multiple variables

272 ANS: 3   PTS: 2   REF: 061127a2   STA: A2.S.6
TOP: Regression

273 ANS:

39,916,800. $\dfrac{_{12}P_{12}}{3! \cdot 2!} = \dfrac{479,001,600}{12} = 39,916,800$

PTS: 2   REF: 081035a2   STA: A2.S.10   TOP: Permutations

274 ANS: 4

$9^{3x+1} = 27^{x+2}$.

$(3^2)^{3x+1} = (3^3)^{x+2}$

$3^{6x+2} = 3^{3x+6}$

$6x + 2 = 3x + 6$

$3x = 4$

$x = \dfrac{4}{3}$

PTS: 2   REF: 081008a2   STA: A2.A.27   TOP: Exponential Equations
KEY: common base not shown

275 ANS:
0, 60, 180, 300. $\sin 2\theta = \sin \theta$

$\sin 2\theta - \sin \theta = 0$

$2 \sin \theta \cos \theta - \sin \theta = 0$

$\sin \theta (2 \cos \theta - 1) = 0$

$\sin \theta = 0 \quad 2 \cos \theta - 1 = 0$

$\theta = 0, 180 \quad \cos \theta = \dfrac{1}{2}$

$\theta = 60, 300$

PTS: 4   REF: 061037a2   STA: A2.A.68   TOP: Trigonometric Equations
KEY: double angle identities

276 ANS: 1   PTS: 2   REF: 061223a2   STA: A2.S.15
TOP: Binomial Probability   KEY: modeling

277 ANS: 2

$\left(\dfrac{w^{-5}}{w^{-9}} \right)^{\frac{1}{2}} = (w^4)^{\frac{1}{2}} = w^2$

PTS: 2   REF: 081011a2   STA: A2.A.8   TOP: Negative and Fractional Exponents

278 ANS: 2   PTS: 2   REF: 081024a2   STA: A2.N.8
TOP: Conjugates of Complex Numbers

279 ANS: 4

$x = 2y.$ $y^2 - (3y)^2 + 32 = 0$. $x = 3(-2) = -6$

$$y^2 - 9y^2 = -32$$

$$-8y^2 = -32$$

$$y^2 = 4$$

$$y = \pm 2$$

PTS: 2 REF: 061312a2 STA: A2.A.3 TOP: Quadratic-Linear Systems
KEY: equations

280 ANS:

$i^{13} + i^{18} + i^{31} + n = 0$

$i + (-1) - i + n = 0$

$-1 + n = 0$

$n = 1$

PTS: 2 REF: 061228a2 STA: A2.N.7 TOP: Imaginary Numbers

281 ANS:

$216\left(\dfrac{\pi}{180}\right) \approx 3.8$

PTS: 2 REF: 061232a2 STA: A2.M.2 TOP: Radian Measure
KEY: radians

282 ANS: 1 PTS: 2 REF: 061211a2 STA: A2.A.54
TOP: Graphing Logarithmic Functions

283 ANS: 2

$x^3 + 3x^2 - 4x - 12$

$x^2(x + 3) - 4(x + 3)$

$(x^2 - 4)(x + 3)$

$(x + 2)(x - 2)(x + 3)$

PTS: 2 REF: 061214a2 STA: A2.A.7 TOP: Factoring by Grouping

284 ANS: 3

$1000 = 500e^{.05t}$

$2 = e^{.05t}$

$\ln 2 = \ln e^{.05t}$

$\dfrac{\ln 2}{.05} = \dfrac{.05t \cdot \ln e}{.05}$

$13.9 \approx t$

PTS: 2 REF: 061313a2 STA: A2.A.6 TOP: Exponential Growth

285 ANS: 2   PTS: 2   REF: 081010a2   STA: A2.A.55
TOP: Trigonometric Ratios

286 ANS: 4   PTS: 2   REF: 061005a2   STA: A2.A.50
TOP: Solving Polynomial Equations

287 ANS: 4
$_{15}C_5 = 3,003.$ $_{25}C_5 = {}_{25}C_{20} = 53,130.$ $_{25}C_{15} = 3,268,760.$

PTS: 2   REF: 061227a2   STA: A2.S.11   TOP: Combinations

288 ANS:
$$x^4 + 4x^3 + 4x^2 + 16x = 0$$
$$x(x^3 + 4x^2 + 4x + 16) = 0$$
$$x(x^2(x + 4) + 4(x + 4)) = 0$$
$$x(x^2 + 4)(x + 4) = 0$$
$$x = 0, \pm 2i, -4$$

PTS: 6   REF: 061339a2   STA: A2.A.26   TOP: Solving Polynomial Equations

289 ANS: 2   PTS: 2   REF: 061122a2   STA: A2.A.24
TOP: Completing the Square

290 ANS: 3
$$75000 = 25000e^{.0475t}$$
$$3 = e^{.0475t}$$
$$\ln 3 = \ln e^{.0475t}$$
$$\frac{\ln 3}{.0475} = \frac{.0475t \cdot \ln e}{.0475}$$
$$23.1 \approx t$$

PTS: 2   REF: 061117a2   STA: A2.A.6   TOP: Exponential Growth

291 ANS: 2   PTS: 2   REF: 061021a2   STA: A2.S.8
TOP: Correlation Coefficient

292 ANS:

$\frac{1}{3}$ $\frac{1}{x+3} - \frac{2}{3-x} = \frac{4}{x^2-9}$

$\frac{1}{x+3} + \frac{2}{x-3} = \frac{4}{x^2-9}$

$\frac{x-3+2(x+3)}{(x+3)(x-3)} = \frac{4}{(x+3)(x-3)}$

$x-3+2x+6 = 4$

$3x = 1$

$x = \frac{1}{3}$

PTS: 4   REF: 081036a2   STA: A2.A.23   TOP: Solving Rationals
KEY: rational solutions

293 ANS:

$\frac{-(x^2-4)}{(x+4)(x+3)} \times \frac{x+3}{2(x-2)} = \frac{-(x+2)(x-2)}{x+4} \times \frac{1}{2(x-2)} = \frac{-(x+2)}{2(x+4)}$

PTS: 4   REF: 061236a2   STA: A2.A.16   TOP: Multiplication and Division of Rationals
KEY: division

294 ANS: 2

```
tan(126°43')
     -1.340788784
■
```
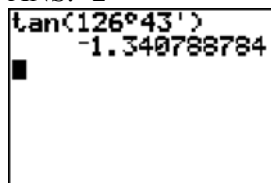
PTS: 2   REF: 061115a2   STA: A2.A.66   TOP: Determining Trigonometric Functions

295 ANS: 3

$\log 4m^2 = \log 4 + \log m^2 = \log 4 + 2\log m$

PTS: 2   REF: 061321a2   STA: A2.A.19   TOP: Properties of Logarithms
KEY: splitting logs

296 ANS: 2

$f(10) = \frac{-10}{(-10)^2-16} = \frac{-10}{84} = -\frac{5}{42}$

PTS: 2   REF: 061102a2   STA: A2.A.41   TOP: Functional Notation

297 ANS:

$\cos\theta \cdot \frac{1}{\cos\theta} - \cos^2\theta = 1 - \cos^2\theta = \sin^2\theta$

PTS: 2   REF: 061230a2   STA: A2.A.58   TOP: Reciprocal Trigonometric Relationships

298 ANS: 3
If $\csc P > 0$, $\sin P > 0$. If $\cot P < 0$ and $\sin P > 0$, $\cos P < 0$

PTS: 2   REF: 061320a2   STA: A2.A.60   TOP: Finding the Terminal Side of an Angle
299 ANS: 4   PTS: 2   REF: 061318a2   STA: A2.A.49
   TOP: Equations of Circles
300 ANS: 3   PTS: 2   REF: 061001a2   STA: A2.A.30
   TOP: Sequences
301 ANS: 1

$$13^2 = 15^2 + 14^2 - 2(15)(14)\cos C$$

$$169 = 421 - 420\cos C$$

$$-252 = -420\cos C$$

$$\frac{252}{420} = \cos C$$

$$53 \approx C$$

PTS: 2   REF: 061110a2   STA: A2.A.73   TOP: Law of Cosines
   KEY: find angle
302 ANS: 3

$$S_8 = \frac{3(1 - (-4)^8)}{1 - (-4)} = \frac{196,605}{5} = -39,321$$

PTS: 2   REF: 061304a2   STA: A2.A.35   TOP: Summations
   KEY: geometric
303 ANS:

$$\frac{\frac{1}{2} - \frac{4}{d}}{\frac{1}{d} + \frac{3}{2d}} = \frac{\frac{d-8}{2d}}{\frac{2d+3d}{2d^2}} = \frac{d-8}{2d} \times \frac{2d^2}{5d} = \frac{d-8}{5}$$

PTS: 2   REF: 061035a2   STA: A2.A.17   TOP: Complex Fractions
304 ANS:
   7. $f(-3) = (-3)^2 - 6 = 3$. $g(x) = 2^3 - 1 = 7$.

PTS: 2   REF: 061135a2   STA: A2.A.42   TOP: Compositions of Functions
   KEY: numbers

305 ANS:

$$81^{x^3 + 2x^2} = 27^{\frac{5x}{3}}$$

$$\left(3^4\right)^{x^3 + 2x^2} = \left(3^3\right)^{\frac{5x}{3}}$$

$$3^{4x^3 + 8x^2} = 3^{5x}$$

$$4x^3 + 8x^2 - 5x = 0$$

$$x(4x^2 + 8x - 5) = 0$$

$$x(2x - 1)(2x + 5) = 0$$

$$x = 0, \frac{1}{2}, -\frac{5}{2}$$

PTS: 6   REF: 061239a2   STA: A2.A.27   TOP: Exponential Equations
KEY: common base not shown

306 ANS: 4   PTS: 2   REF: 061112a2   STA: A2.A.39
TOP: Domain and Range   KEY: real domain

307 ANS: 1
common difference is 2. $b_n = x + 2n$

$$10 = x + 2(1)$$

$$8 = x$$

PTS: 2   REF: 081014a2   STA: A2.A.29   TOP: Sequences

308 ANS:
$x^2 - 6x - 27 = 0$, $\frac{-b}{a} = 6$. $\frac{c}{a} = -27$. If $a = 1$ then $b = -6$ and $c = -27$

PTS: 4   REF: 061130a2   STA: A2.A.21   TOP: Roots of Quadratics
KEY: basic

309 ANS: 3
sum of the roots, $\frac{-b}{a} = \frac{-(-9)}{4} = \frac{9}{4}$. product of the roots, $\frac{c}{a} = \frac{3}{4}$

PTS: 2   REF: 061208a2   STA: A2.A.21   TOP: Roots of Quadratics
KEY: basic

310 ANS: 3
period $= \dfrac{2\pi}{b} = \dfrac{2\pi}{3\pi} = \dfrac{2}{3}$

PTS: 2   REF: 081026a2   STA: A2.A.70   TOP: Graphing Trigonometric Functions
KEY: recognize

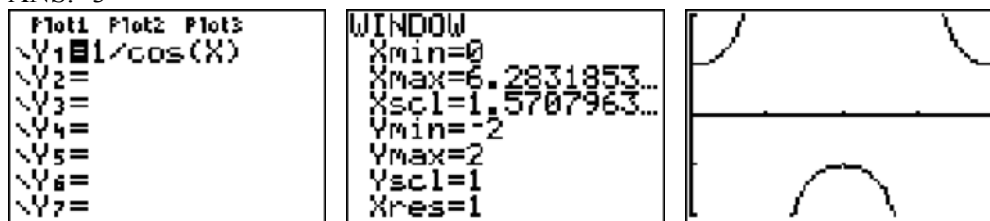311 ANS:

$5 \csc \theta = 8$

$\csc \theta = \dfrac{8}{5}$

$\sin \theta = \dfrac{5}{8}$

$\theta \approx 141$

PTS: 2 REF: 061332a2 STA: A2.A.68 TOP: Trigonometric Equations
KEY: reciprocal functions

312 ANS: 3

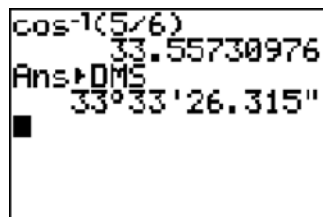PTS: 2 REF: 061020a2 STA: A2.A.71 TOP: Graphing Trigonometric Functions

313 ANS: 3

$$\dfrac{3}{\sqrt{3a^2 b}} = \dfrac{3}{a\sqrt{3b}} \cdot \dfrac{\sqrt{3b}}{\sqrt{3b}} = \dfrac{3\sqrt{3b}}{3ab} = \dfrac{\sqrt{3b}}{ab}$$

PTS: 2 REF: 081019a2 STA: A2.A.15 TOP: Rationalizing Denominators
KEY: index = 2

314 ANS: 1

$\cos K = \dfrac{5}{6}$

$K = \cos^{-1} \dfrac{5}{6}$

$K \approx 33°33'$

PTS: 2 REF: 061023a2 STA: A2.A.55 TOP: Trigonometric Ratios

315 ANS: 3

$${}_6 C_3 \left(\dfrac{x}{2} \right)^3 (-2y)^3 = 20 \cdot \dfrac{x^3}{8} \cdot -8y^3 = -20x^3 y^3$$

PTS: 2 REF: 061215a2 STA: A2.A.36 TOP: Binomial Expansions

316 ANS: 1 PTS: 2 REF: 061004a2 STA: A2.A.52
TOP: Identifying the Equation of a Graph

317 ANS: 1 PTS: 2 REF: 061316a2 STA: A2.S.8
TOP: Correlation Coefficient

318 ANS: 4 PTS: 2 REF: 081005a2 STA: A2.A.60
TOP: Unit Circle

319 ANS: 3

$$\frac{-7 \pm \sqrt{7^2 - 4(2)(-3)}}{2(2)} = \frac{-7 \pm \sqrt{73}}{4}$$

PTS: 2 REF: 081009a2 STA: A2.A.25 TOP: Quadratic Formula

320 ANS: 2

$4^{2x+5} = 8^{3x}$.

$\left(2^2\right)^{2x+5} = \left(2^3\right)^{3x}$

$2^{4x+10} = 2^{9x}$

$4x + 10 = 9x$

$10 = 5x$

$2 = x$

PTS: 2 REF: 061105a2 STA: A2.A.27 TOP: Exponential Equations
KEY: common base not shown

321 ANS:

$\sigma_x = 14.9$. $\bar{x} = 40$. There are 8 scores between 25.1 and 54.9.

PTS: 4 REF: 061237a2 STA: A2.S.4 TOP: Dispersion
KEY: advanced

322 ANS:

0.167. $_{10}C_8 \cdot 0.6^8 \cdot 0.4^2 + {}_{10}C_9 \cdot 0.6^9 \cdot 0.4^1 + {}_{10}C_{10} \cdot 0.6^{10} \cdot 0.4^0 \approx 0.167$

PTS: 4 REF: 061036a2 STA: A2.S.15 TOP: Binomial Probability
KEY: at least or at most

323 ANS:

$\left(-\frac{9}{2}, \frac{1}{2}\right)$ and $\left(\frac{1}{2}, \frac{11}{2}\right)$. $y = x + 5$. $4x^2 + 17x - 4 = x + 5$

$y = 4x^2 + 17x - 4$ $4x^2 + 16x - 9 = 0$

$(2x + 9)(2x - 1) = 0$

$x = -\frac{9}{2}$ and $x = \frac{1}{2}$

$y = -\frac{9}{2} + 5 = \frac{1}{2}$ and $y = \frac{1}{2} + 5 = \frac{11}{2}$

PTS: 6 REF: 061139a2 STA: A2.A.3 TOP: Quadratic-Linear Systems
KEY: equations

324 ANS:

26.2%. ${}_{10}C_8 \cdot 0.65^8 \cdot 0.35^2 + {}_{10}C_9 \cdot 0.65^9 \cdot 0.35^1 + {}_{10}C_{10} \cdot 0.65^{10} \cdot 0.35^0 \approx 0.262$

PTS: 4   REF: 081038a2   STA: A2.S.15   TOP: Binomial Probability
KEY: at least or at most

325 ANS:

$\sigma_x \approx 6.2$. 6 scores are within a population standard deviation of the mean. $Q_3 - Q_1 = 41 - 37 = 4$

$\overline{x} \approx 38.2$

PTS: 4   REF: 061338a2   STA: A2.S.4   TOP: Dispersion
KEY: advanced

326 ANS: 1

${}_{10}C_4 = 210$

PTS: 2   REF: 061113a2   STA: A2.S.11   TOP: Combinations

327 ANS: 2   PTS: 2   REF: 081003a2   STA: A2.A.51
TOP: Domain and Range

328 ANS:

$y = x^2 - 6$. $f^{-1}(x)$ is not a function.

$x = y^2 - 6$

$x + 6 = y^2$

$\pm\sqrt{x+6} = y$

PTS: 2   REF: 061132a2   STA: A2.A.44   TOP: Inverse of Functions
KEY: equations

329 ANS: 2

$\dfrac{1 - \dfrac{4}{x}}{1 - \dfrac{2}{x} - \dfrac{8}{x^2}} \times \dfrac{x^2}{x^2} = \dfrac{x^2 - 4x}{x^2 - 2x - 8} = \dfrac{x(x-4)}{(x-4)(x+2)} = \dfrac{x}{x+2}$

PTS: 2   REF: 061305a2   STA: A2.A.17   TOP: Complex Fractions

330 ANS: 4

$\dfrac{3 \pm \sqrt{(-3)^2 - 4(1)(-9)}}{2(1)} = \dfrac{3 \pm \sqrt{45}}{2} = \dfrac{3 \pm 3\sqrt{5}}{2}$

PTS: 2   REF: 061009a2   STA: A2.A.25   TOP: Quadratic Formula

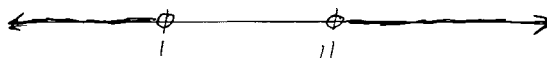331 ANS: 1   PTS: 2   REF: 061019a2   STA: A2.N.7
TOP: Imaginary Numbers

332 ANS:

$-3|6 - x| < -15$

$|6 - x| > 5$

$6 - x > 5$ or $6 - x < -5$

$1 > x$ or $11 < x$

PTS: 2   REF: 061137a2   STA: A2.A.1   TOP: Absolute Value Inequalities
KEY: graph

333 ANS: 3
$68\% \times 50 = 34$

PTS: 2   REF: 081013a2   STA: A2.S.5   TOP: Normal Distributions
KEY: predict

334 ANS: 3
$\sqrt[3]{4^3 a^{15} a} = 4a^5 \sqrt[3]{a}$

PTS: 2   REF: 061204a2   STA: A2.A.13   TOP: Simplifying Radicals
KEY: index > 2

335 ANS: 2   PTS: 2   REF: 061322a2   STA: A2.A.73
TOP: Law of Sines   KEY: side, without calculator

336 ANS: 2   PTS: 2   REF: 061108a2   STA: A2.A.52
TOP: Identifying the Equation of a Graph

337 ANS: 1

PTS: 2   REF: 061225a2   STA: A2.S.8   TOP: Correlation Coefficient

338 ANS: 1

$-420 \left(\dfrac{\pi}{180} \right) = -\dfrac{7\pi}{3}$

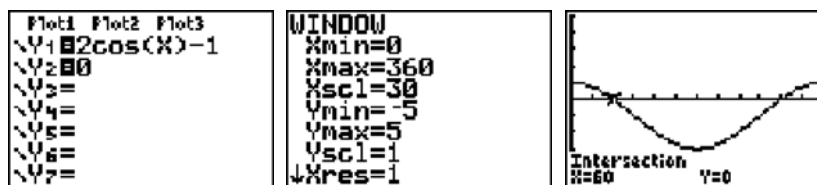PTS: 2   REF: 081002a2   STA: A2.M.2   TOP: Radian Measure
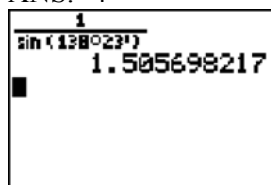KEY: radians

339   ANS: 4

$2\cos\theta = 1$

$\cos\theta = \dfrac{1}{2}$

$\theta = \cos^{-1}\dfrac{1}{2} = 60, 300$

PTS: 2   REF: 061203a2   STA: A2.A.68   TOP: Trigonometric Equations
KEY: basic

340   ANS: 4

PTS: 2   REF: 061217a2   STA: A2.A.66   TOP: Determining Trigonometric Functions

341   ANS: 4

$\dfrac{4\cdot 0 + 6\cdot 1 + 10\cdot 2 + 0\cdot 3 + 4k + 2\cdot 5}{4 + 6 + 10 + 0 + k + 2} = 2$

$$\dfrac{4k + 36}{k + 22} = 2$$

$$4k + 36 = 2k + 44$$

$$2k = 8$$

$$k = 4$$

PTS: 2   REF: 061221a2   STA: A2.S.3   TOP: Average Known with Missing Data

342   ANS: 1

$2i^2 + 3i^3 = 2(-1) + 3(-i) = -2 - 3i$

PTS: 2   REF: 081004a2   STA: A2.N.7   TOP: Imaginary Numbers

343   ANS:
7.4

PTS: 2   REF: 061029a2   STA: A2.S.4   TOP: Dispersion
KEY: basic, group frequency distributions

344 ANS: 3

$$4^{x^2 + 4x} = 2^{-6}. \qquad 2x^2 + 8x = -6$$

$$(2^2)^{x^2 + 4x} = 2^{-6} \qquad 2x^2 + 8x + 6 = 0$$

$$2^{2x^2 + 8x} = 2^{-6} \qquad x^2 + 4x + 3 = 0$$

$$(x + 3)(x + 1) = 0$$

$$x = -3 \; x = -1$$

PTS: 2   REF: 061015a2   STA: A2.A.27   TOP: Exponential Equations
KEY: common base shown

345 ANS: 4

$$7^2 = 3^2 + 5^2 - 2(3)(5)\cos A$$

$$49 = 34 - 30\cos A$$

$$15 = -30\cos A$$

$$-\frac{1}{2} = \cos A$$

$$120 = \cos A$$

PTS: 2   REF: 081017a2   STA: A2.A.73   TOP: Law of Cosines
KEY: angle, without calculator

346 ANS: 4

$$4 + 3(2 - x) + 3(3 - x) + 3(4 - x) + 3(5 - x)$$

$$4 + 6 - 3x + 9 - 3x + 12 - 3x + 15 - 3x$$

$$46 - 12x$$

PTS: 2   REF: 061315a2   STA: A2.N.10   TOP: Sigma Notation
KEY: basic

347 ANS: 4

$$\frac{13}{\sin 40} = \frac{20}{\sin M}. \; 81 + 40 < 180. \; (180 - 81) + 40 < 180$$

$$M \approx 81$$

PTS: 2   REF: 061327a2   STA: A2.A.75   TOP: Law of Sines - The Ambiguous Case

348 ANS: 4

$$\frac{2\pi}{b} = \frac{2\pi}{\dfrac{1}{3}} = 6\pi$$

PTS: 2   REF: 061027a2   STA: A2.A.69
TOP: Properties of Graphs of Trigonometric Functions   KEY: period

349 ANS: 3

$$2\pi \cdot \frac{5}{12} = \frac{10\pi}{12} = \frac{5\pi}{6}$$

PTS: 2   REF: 061125a2   STA: A2.M.1   TOP: Radian Measure

350 ANS:

$$12t^8 - 75t^4 = 3t^4(4t^4 - 25) = 3t^4(2t^2 + 5)(2t^2 - 5)$$

PTS: 2   REF: 061133a2   STA: A2.A.7
TOP: Factoring the Difference of Perfect Squares   KEY: binomial

351 ANS: 3

$$\frac{4x - 5}{3} > 1 \text{ or } \frac{4x - 5}{3} < -1$$

$$4x - 5 > 3 \qquad 4x - 5 < -3$$

$$4x > 8 \qquad 4x < 2$$

$$x > 2 \qquad x < \frac{1}{2}$$

PTS: 2   REF: 061209a2   STA: A2.A.1   TOP: Absolute Value Inequalities
KEY: graph