0616a2

1 The expression $\frac{3}{4}\sqrt{-80}$ is equivalent to

1) $3i\sqrt{5}$
2) $2i\sqrt{15}$
3) $-3\sqrt{5}$
4) $-2\sqrt{15}$

2 In $\triangle RST$, m$\angle S = 135$, $r = 27$, and $t = 19$. What is the area of $\triangle RST$ to the *nearest tenth of a square unit*?

1) 90.7
2) 181.4
3) 256.5
4) 362.7

3 The expression $\dfrac{\sqrt{5}}{7-\sqrt{5}}$ is equivalent to

1) $\dfrac{7\sqrt{5}+5}{54}$
2) $\dfrac{7\sqrt{5}-5}{54}$
3) $\dfrac{7\sqrt{5}+5}{44}$
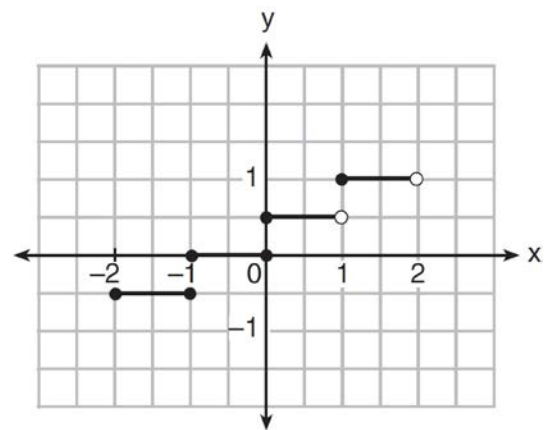4) $\dfrac{7\sqrt{5}-5}{44}$

4 A multiple-choice test has 4 possible choices for each question. A person guesses on 10 questions. What is the probability the person gets *exactly* 8 questions correct?

1) $_{10}C_8\left(\dfrac{1}{4}\right)^2\left(\dfrac{3}{4}\right)^8$
2) $_{10}C_8\left(\dfrac{1}{4}\right)^8\left(\dfrac{3}{4}\right)^2$
3) $_{10}C_8\left(\dfrac{1}{10}\right)^2\left(\dfrac{9}{10}\right)^8$
4) $_{10}C_8\left(\dfrac{1}{10}\right)^8\left(\dfrac{9}{10}\right)^2$

5 The summation $2\sum\limits_{n=3}^{6}\cos\left(\dfrac{\pi}{n-2}\right)$ equals

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

6 The graph of a relation is shown below.

What is the domain of this relation?
1) $\{-2,-1,0,1\}$
2) $\left\{-\dfrac{1}{2},0,\dfrac{1}{2},1\right\}$
3) $\{x \mid -2 \leq x < 2\}$
4) $\{x \mid -2 \leq x \leq 2\}$

7 The Mathematics Club will select a president, a vice president, and a treasurer for the club. If there are 15 members in the club, how many different selections of a president, a vice president, and a treasurer are possible if each club member can be selected to only one position?
1) 42
2) 455
3) 2730
4) 3375

8 For which equation will $f(-2) = -6$?
1) $f(x) = x^3 + x$
2) $f(x) = x^4 - 5x$
3) $f(x) = 4x^3 + 6x^2 - x$
4) $f(x) = -3x^3 - 4x^2 + 4x$

9 What is the product of $x^2 - 2x + 3$ and $x + 1$?
1) $x^3 - x^2 + x + 3$
2) $x^3 - 2x^2 + 3x$
3) $x^2 - 3x + 2$
4) $x^2 - x + 4$

10 A principal is concerned about the decline in the number of students who purchase food from the cafeteria. A survey was developed to assist the principal. The most appropriate method would be for the principal to randomly select 100 students from
1) the junior class
2) the student directory
3) the Algebra 2/Trigonometry classes
4) the students who are eating during fourth period lunch in the cafeteria

11 The solution of $8^{1-p} = 16^{2p-1}$ is
1) $\dfrac{7}{11}$
2) $\dfrac{3}{5}$
3) $\dfrac{4}{9}$
4) $\dfrac{2}{5}$

12 Which relation is *not* a function?
1) $\{(x,y) : y = |x|\}$
2) $\{(x,y) : y = -x^2\}$
3) $\{(x,y) : y = x\}$
4) $\{(x,y) : y = \pm\sqrt{x}\}$

13 What does the correlation coefficient of -0.975 on a linear regression indicate?
1) The slope is positive.
2) One variable causes the other.
3) The scatterplot shows no association of the variables.
4) One variable has a strong relationship with the other.

14 Which angle has the same terminal side as an angle of $155°$?
1) $-205°$
2) $-155°$
3) $25°$
4) $335°$

15 For any power of i, the imaginary unit, where b is a whole number, i^{4b+3} equals
1) 1
2) i
3) -1
4) $-i$

16 What is the solution set of $x - \dfrac{10}{x} + 3 = 0$?
1) $\{-5,2\}$
2) $\{-2,5\}$
3) $\{-1,10\}$
4) $\{-10,1\}$

17 In triangle ABC, if m$\angle A = 40$, $BC = 10$, and $AB = 12$, then m$\angle C$ can be
1) an acute angle, only
2) a right angle, only
3) an obtuse angle, only
4) either an acute or an obtuse angle

18 To the *nearest thousandth*, what is $23°50'$, in radian measure?
1) 0.416
2) 0.415
3) 0.410
4) 0.409

19 When $f(x) = \dfrac{x-7}{2}$, what is the value of

$\left(f \circ f^{-1}\right)(3)$?

1) $2x + 7$
2) -2
3) 3
4) x

20 What is the equation of the circle passing through the point $(-5,-2)$ whose center is at $(-2,3)$?

1) $(x+5)^2 + (y+2)^2 = 34$
2) $(x+5)^2 + (y+2)^2 = 50$
3) $(x+2)^2 + (y-3)^2 = 34$
4) $(x+2)^2 + (y-3)^2 = 50$

21 If $a = -2$ and $b = -3$, what is the value of the expression $\dfrac{c^a}{c^b} - \dfrac{c^b}{c^a}$, when $c \neq 0$?

1) 0
2) $\dfrac{c^2 + 1}{c}$
3) $2c$
4) $\dfrac{c^2 - 1}{c}$

22 What is the fourth term in the expansion of $(2x - 1)^6$?

1) $-160x^3$
2) $-40x^3$
3) $16x^4$
4) $240x^4$

23 If the roots of a quadratic equation are real, irrational, and unequal, the discriminant could have a value of

1) 1
2) 0
3) 8
4) -6

24 What is the nth term of the sequence $-1, 3, 7, 11, \ldots$?

1) $a_n = -1 - 4(n-1)$
2) $a_n = -1 + 4(n-1)$
3) $a_n = 4 - (n-1)$
4) $a_n = 4 + (n-1)$

25 What is the sample standard deviation of the data in the table below, rounded to the *nearest tenth*?

Scores	Frequency
50	1
60	2
70	7
80	6
90	3
100	2

1) 12.5
2) 12.8
3) 17.1
4) 18.7

26 Which equation is *not* true?

1) $\cot^2 \theta = 1 - \sec^2 \theta$
2) $\sin^2 \theta = 1 - \cos^2 \theta$
3) $\sec^2 \theta = \tan^2 \theta + 1$
4) $\csc^2 \theta = 1 + \cot^2 \theta$

27 Which quadratic equation has roots whose sum is $-\dfrac{9}{4}$ and product is $\dfrac{2}{3}$?

1) $12x^2 + 8x + 27 = 0$
2) $12x^2 - 27x + 8 = 0$
3) $12x^2 - 8x - 27 = 0$
4) $12x^2 + 27x + 8 = 0$

28 Factor $6x^3 + 33x^2 - 63x$ completely.

29 Five thousand dollars is invested at an interest rate of 3.5% compounded quarterly. No money is deposited or withdrawn from the account. Using the formula below, determine, to the *nearest cent*, how much this investment will be worth in 18 years.

$$A = P\left(1 + \frac{r}{n}\right)^{nt}$$

A = amount

P = principal

r = interest rate

n = number of times the interest rate
    compounded annually

t = time in years

30 A colony of bacteria grows exponentially. The table below shows the data collected daily.

Day (x)	Population (y)
0	200
1	425
2	570
3	800
4	1035
5	1650
6	2600

State the exponential regression equation for the data, rounding all values to the *nearest hundredth*.

31 Express $\dfrac{2 + \dfrac{6}{x-3}}{\dfrac{x}{x-3}}$ in simplest form, where $x \neq 0$ and $x \neq 3$.

32 A central angle whose measure is $\dfrac{2\pi}{3}$ radians intercepts an arc with a length of 4π feet. Find the radius of the circle, *in feet*.

33 A sine function is graphed below.
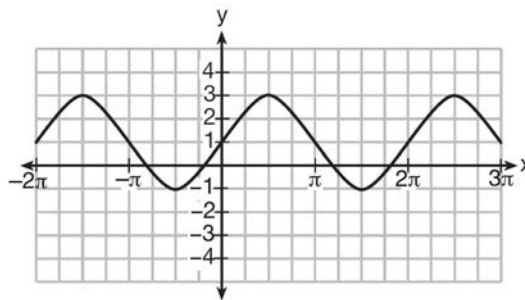
Determine and state the amplitude and period of this function.

34 On the Algebra 2/Trigonometry midterm at Champion High School, the scores of 210 students were normally distributed with a mean of 82 and a standard deviation of 4.2. Determine how many students scored between 79.9 and 88.3.

35 Given $\tan\theta = -\dfrac{5}{12}$ and $\dfrac{\pi}{2} < \theta < \pi$, determine the *exact* value of the expression $\sin\theta \cot\theta$.

36 The lengths of the sides of a triangle are 6 cm, 11 cm, and 7 cm. Determine, to the *nearest tenth of a degree*, the measure of the largest angle of the triangle.

37 Solve algebraically for c: $\left|\dfrac{3}{2}c - 10\right| - 9 \leq -1$

38 Solve $2\cos^2\theta = \cos\theta$ for all values of θ in the interval $0° \leq \theta < 360°$.

39 Solve for p algebraically:
$$\log_{16}(p^2 - p + 4) - \log_{16}(2p + 11) = \frac{3}{4}$$

0616a2
Answer Section

1 ANS: 1

$$\frac{3}{4}\sqrt{-1}\sqrt{16}\sqrt{5} = 3i\sqrt{5}$$

PTS: 2   REF: 061601a2   STA: A2.N.6   TOP: Square Roots of Negative Numbers

2 ANS: 2

$$K = \frac{1}{2}(27)(19)\sin 135 \approx 181.4$$

PTS: 2   REF: 061602a2   STA: A2.A.74   TOP: Using Trigonometry to Find Area
KEY: basic

3 ANS: 3

$$\frac{\sqrt{5}}{7-\sqrt{5}} \cdot \frac{7+\sqrt{5}}{7+\sqrt{5}} = \frac{7\sqrt{5}+5}{49-5} = \frac{7\sqrt{5}+5}{44}$$

PTS: 2   REF: 061603a2   STA: A2.N.5   TOP: Rationalizing Denominators

4 ANS: 2   PTS: 2   REF: 061604a2   STA: A2.S.15
TOP: Binomial Probability   KEY: modeling

5 ANS: 4

$$2\left(\cos\frac{\pi}{3-2} + \cos\frac{\pi}{4-2} + \cos\frac{\pi}{5-2} + \cos\frac{\pi}{6-2}\right) = 2\left(-1+0+\frac{1}{2}+\frac{\sqrt{2}}{2}\right) = 2\left(-\frac{1}{2}+\frac{\sqrt{2}}{2}\right) = -1+\sqrt{2}$$

PTS: 2   REF: 061605a2   STA: A2.N.10   TOP: Sigma Notation
KEY: advanced

6 ANS: 3   PTS: 2   REF: 061606a2   STA: A2.A.51
TOP: Domain and Range   KEY: graph

7 ANS: 3

$$_{15}P_3 = 2730$$

PTS: 2   REF: 061607a2   STA: A2.S.10   TOP: Permutations

8 ANS: 3

$$f(-2) = 4(-2)^3 + 6(-2)^2 - (-2) = -32 + 24 + 2 = -6$$

PTS: 2   REF: 061608a2   STA: A2.A.41   TOP: Functional Notation

9 ANS: 1

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

PTS: 2   REF: 061609a2   STA: A2.N.3   TOP: Operations with Polynomials
KEY: multiplication

10 ANS: 2
To determine student interest, survey the widest range of students.

    PTS: 2   REF: 061610a2   STA: A.S.3   TOP: Analysis of Data
    KEY: bias

11 ANS: 1

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

$$3 - 3p = 8p - 4$$

$$7 = 11p$$

$$\frac{7}{11} = p$$

    PTS: 2   REF: 061611a2   STA: A2.A.27   TOP: Exponential Equations
    KEY: common base not shown

12 ANS: 4   PTS: 2   REF: 061612a2   STA: A2.A.38
    TOP: Defining Functions

13 ANS: 4   PTS: 2   REF: 061613a2   STA: A2.S.8
    TOP: Correlation Coefficient

14 ANS: 1

$$-205° + 360° = 155°$$

    PTS: 2   REF: 061614a2   STA: A2.A.60   TOP: Unit Circle

15 ANS: 4   PTS: 2   REF: 061615a2   STA: A2.N.7
    TOP: Imaginary Numbers

16 ANS: 1

$$x^2 - 10 + 3x = 0$$

$$x^2 + 3x - 10 = 0$$

$$(x + 5)(x - 2) = 0$$

$$x = -5, 2$$

    PTS: 2   REF: 061616a2   STA: A2.A.23   TOP: Solving Rationals
    KEY: rational solutions

17 ANS: 4

$$\frac{10}{\sin 40} = \frac{12}{\sin C} \qquad 50.5 + 40 < 180$$

$$C = \sin^{-1}\frac{12\sin 40}{10} \qquad 129.5 + 40 < 180$$

$$\approx 50.5$$

    PTS: 2   REF: 061617a2   STA: A2.A.75   TOP: Law of Sines - The Ambiguous Case

18 ANS: 1

$$23 \frac{5}{6} \left(\frac{\pi}{180} \right) \approx 0.416$$

PTS: 2   REF: 061618a2   STA: A2.M.2   TOP: Radian Measure
KEY: radians

19 ANS: 3

$$x = \frac{y-7}{2} \quad f^{-1}(3) = 2(3) + 7 = 13$$

$$y = 2x + 7 \quad f(13) = \frac{13-7}{2} = 3$$

PTS: 2   REF: 061619a2   STA: A2.A.44   TOP: Inverse of Functions
KEY: equations

20 ANS: 3

$$r = \sqrt{(-5 - -2)^2 + (-2 - 3)^2} = \sqrt{9 + 25} = \sqrt{34}$$

PTS: 2   REF: 061620a2   STA: A2.A.48   TOP: Equations of Circles

21 ANS: 4

$$\frac{c^{-2}}{c^{-3}} - \frac{c^{-3}}{c^{-2}} = c - \frac{1}{c} = \frac{c^2 - 1}{c}$$

PTS: 2   REF: 061621a2   STA: A2.N.1   TOP: Negative and Fractional Exponents

22 ANS: 1

$$_{56}C_3 (2x)^3 (-1)^3 = 20 \cdot 8x^3 \cdot -1 = -160x^3$$

PTS: 2   REF: 061622a2   STA: A2.A.36   TOP: Binomial Expansions

23 ANS: 3   PTS: 2   REF: 061623a2   STA: A2.A.2
TOP: Using the Discriminant   KEY: determine equation given nature of roots

24 ANS: 2   PTS: 2   REF: 061624a2   STA: A2.A.29
TOP: Sequences

25 ANS: 2   PTS: 2   REF: 061625a2   STA: A2.S.4
TOP: Dispersion   KEY: basic, group frequency distributions

26 ANS: 1

$$\cot^2 \theta = 1 - \sec^2 \theta$$

$$\frac{\cos^2 \theta}{\sin^2 \theta} = 1 - \frac{1}{\cos^2 \theta}$$

$$\frac{\cos^2 \theta}{\sin^2 \theta} = \frac{\cos^2 \theta - 1}{\cos^2 \theta}$$

$$\frac{\cos^2 \theta}{\sin^2 \theta} \neq \frac{-\sin^2 \theta}{\cos^2 \theta}$$

PTS: 2   REF: 061626a2   STA: A2.A.67   TOP: Simplifying Trigonometric Expressions

27 ANS: 4

sum of the roots, $\dfrac{-b}{a} = \dfrac{-27}{12} = -\dfrac{9}{4}.$ product of the roots, $\dfrac{c}{a} = \dfrac{8}{12} = \dfrac{2}{3}$

PTS: 2   REF: 061627a2   STA: A2.A.21   TOP: Roots of Quadratics
KEY: basic

28 ANS:

$6x^3 + 33x^2 - 63x$

$3x(2x^2 + 11x - 21)$

$3x(x + 7)(2x - 3)$

PTS: 2   REF: 061628a2   STA: A2.A.7   TOP: Factoring Polynomials
KEY: single variable

29 ANS:

$A = 5000\left(1 + \dfrac{.035}{4}\right)^{4 \cdot 18} \approx 9362.36$

PTS: 2   REF: 061629a2   STA: A2.A.12   TOP: Evaluating Exponential Expressions

30 ANS:

$y = 239.21(1.48)^x$

PTS: 2   REF: 061630a2   STA: A2.S.7   TOP: Regression
KEY: exponential

31 ANS:

$\dfrac{2 + \dfrac{6}{x-3}}{\dfrac{x}{x-3}} \cdot \dfrac{\dfrac{x-3}{1}}{\dfrac{x-3}{1}} = \dfrac{2(x-3) + 6}{x} = \dfrac{2x - 6 + 6}{x} = 2$

PTS: 2   REF: 061631a2   STA: A2.A.17   TOP: Complex Fractions

32 ANS:

$r = \dfrac{s}{\theta} = \dfrac{4\pi}{\dfrac{2\pi}{3}} = 6$

PTS: 2   REF: 061632a2   STA: A2.A.61   TOP: Arc Length
KEY: radius

33 ANS:

$2, 2\pi$

PTS: 2   REF: 061633a2   STA: A2.A.69
TOP: Properties of Graphs of Trigonometric Functions   KEY: period

34 ANS:
$(0.191 + 0.433)210 \approx 131$

PTS: 2   REF: 061634a2   STA: A2.S.5   TOP: Normal Distributions
KEY: predict

35 ANS:
$\sin \theta \cot \theta = \left(-\dfrac{12}{5} \right) \left(\dfrac{5}{13} \right) = -\dfrac{60}{65}$

PTS: 2   REF: 061635a2   STA: A2.A.64   TOP: Using Inverse Trigonometric Functions
KEY: advanced

36 ANS:
$11^2 = 6^2 + 7^2 - 2(6)(7)\cos A$

$121 = 85 - 84\cos A$

$36 = -84\cos A$

$-\dfrac{36}{84} = \cos A$

$115.4 \approx A$

PTS: 4   REF: 061636a2   STA: A2.A.73   TOP: Law of Cosines
KEY: find angle

37 ANS:
$\left| \dfrac{3}{2}c - 10 \right| \le 8 \quad \dfrac{3}{2}c - 10 \le 8 \ \text{ and } \ \dfrac{3}{2}c - 10 \ge -8$

$\dfrac{3}{2}c \le 18 \qquad\qquad \dfrac{3}{2}c \ge 2$

$c \le 12 \qquad\qquad c \ge \dfrac{4}{3}$

PTS: 4   REF: 061637a2   STA: A2.A.1   TOP: Absolute Value Inequalities

38 ANS:
$2\cos^2 \theta - \cos \theta = 0$

$\cos \theta(2\cos \theta - 1) = 0$

$\cos \theta = 0, \dfrac{1}{2}$

$\theta = 90, 270, 60, 300$

PTS: 4   REF: 061638a2   STA: A2.A.68   TOP: Trigonometric Equations
KEY: quadratics

39 ANS:

$$\log_{16}\left(\frac{p^2 - p + 4}{2p + 11}\right) = \frac{3}{4}$$

$$\frac{p^2 - p + 4}{2p + 11} = 16^{\frac{3}{4}}$$

$$\frac{p^2 - p + 4}{2p + 11} = 8$$

$$p^2 - p + 4 = 16p + 88$$

$$p^2 - 17p - 84 = 0$$

$$(p - 21)(p + 4) = 0$$

$$p = 21, -4$$

PTS: 6   REF: 061639a2   STA: A2.A.28   TOP: Logarithmic Equations
KEY: applying properties of logarithms