

# JEFFERSON MATH PROJECT

## REGENTS BY CHAPTER

All 1165 NY Math A & B Regents Exam Questions from  
June 1999 to August 2005 Sorted by Prentice Hall Chapter  
ADVANCED ALGEBRA

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*Dear Sir*

*I have to acknowledge the receipt 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 indispensable 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.

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## ADVANCED ALGEBRA

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# ADVANCED ALGEBRA

## CHAPTER 1-3

1. If  $f(x) = 4x^0 + (4x)^{-1}$ , what is the value of  $f(4)$ ?

- [A] -12    [B] 0    [C]  $4\frac{1}{16}$     [D]  $1\frac{1}{16}$

2. Which relation is *not* a function?

- [A]  $x = y^2 + 2x - 3$     [B]  $y = 2x + 4$   
[C]  $y = x^2 - 4x + 3$     [D]  $x = 3y - 2$

3. Which relation is a function?

- [A]  $x = y^2 + 1$     [B]  $y = \sin x$   
[C]  $x = 4$     [D]  $x^2 + y^2 = 16$

4. Which equation represents a function?

- [A]  $x = y^2 - 6x + 8$     [B]  $x^2 + y^2 = 4$   
[C]  $4y^2 = 36 - 9x^2$     [D]  $y = x^2 - 3x - 4$

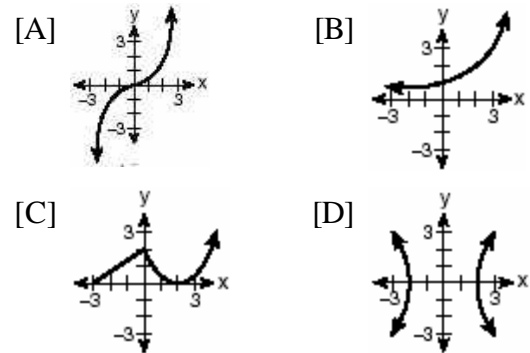
5. Which set of ordered pairs is *not* a function?

- [A]  $\{(1,2), (3,4), (4,5), (5,6)\}$   
[B]  $\{(3,1), (2,1), (1,2), (3,2)\}$   
[C]  $\{(0,0), (1,1), (2,2), (3,3)\}$   
[D]  $\{(4,1), (5,1), (6,1), (7,1)\}$

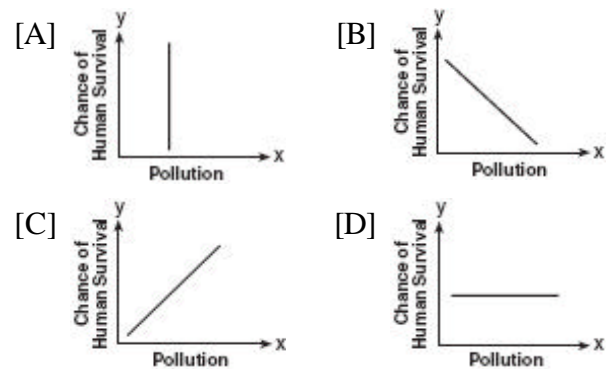
6. Which relation is a function?

- [A]  $x^2 + y^2 = 7$     [B]  $x = 7$   
[C]  $x^2 - y^2 = 7$     [D]  $xy = 7$

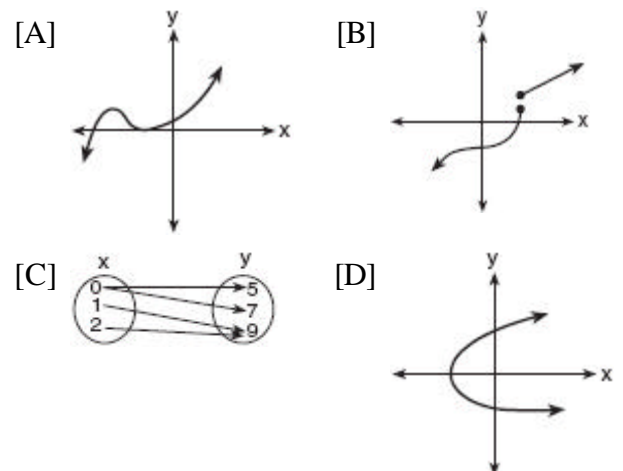
7. Which graph is *not* a function?



8. Which graph does not represent a function of  $x$ ?

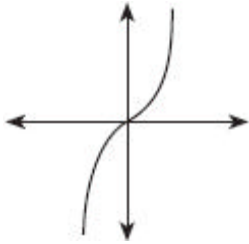


9. Which diagram represents a relation in which each member of the domain corresponds to only one member of its range?

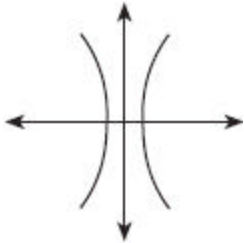


10. Which diagram represents a one-to-one function?

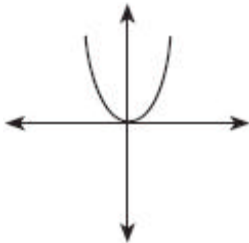
[A]



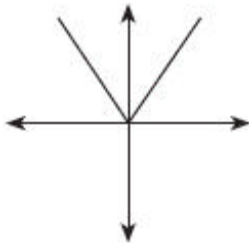
[B]



[C]



[D]



14. If  $f(x) = -2x + 7$  and  $g(x) = x^2 - 2$ , then  $f(g(3))$  is equal to

- [A] 7      [B] -7      [C] -3      [D] -1

15. If  $f$  and  $g$  are two functions defined by  $f(x) = 3x + 5$  and  $g(x) = x^2 + 1$ , then  $g(f(x))$  is

- [A]  $9x^2 + 26$       [B]  $9x^2 + 30x + 26$   
[C]  $x^2 + 3x + 6$       [D]  $3x^2 + 8$

16. If  $f(x) = \frac{2}{x+3}$  and  $g(x) = \frac{1}{x}$ , then  $(g \circ f)(x)$  is equal to

- [A]  $\frac{x+3}{2x}$       [B]  $\frac{2x}{1+3x}$   
[C]  $\frac{1+3x}{2x}$       [D]  $\frac{x+3}{2}$

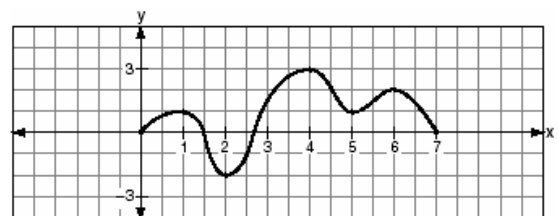
17. If  $f(x) = x + 1$  and  $g(x) = x^2 - 1$ , the expression  $(g \circ f)(x)$  equals 0 when  $x$  is equal to

- [A] 1 and -1      [B] 0 and -2  
[C] 0, only      [D] -2, only

18. If  $f(x) = 2x^2 + 4$  and  $g(x) = x - 3$ , which number satisfies  $f(x) = (f \circ g)(x)$ ?

- [A] 4      [B]  $\frac{3}{2}$       [C] 5      [D]  $\frac{3}{4}$

19. The accompanying graph is a sketch of the function  $y = f(x)$  over the interval  $0 \leq x \leq 7$ .



What is the value of  $(f \circ f)(6)$ ?

- [A] 0      [B] 1      [C] -2      [D] 2

## ADVANCED ALGEBRA CHAPTER 1-4

11. If  $f(x) = 5x^2$  and  $g(x) = \sqrt{2x}$ , what is the value of  $(f \circ g)(8)$

- [A] 1,280      [B] 16      [C]  $8\sqrt{10}$       [D] 80

12. If  $f(x) = x^{\frac{2}{3}}$  and  $g(x) = 8x^{\frac{1}{2}}$ , find  $(f \circ g)(x)$  and  $(f \circ g)(27)$ .

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

20. A certain drug raises a patient's heart rate,  $h(x)$ , in beats per minute, according to the function  $h(x) = 70 + 0.2x$ , where  $x$  is the bloodstream drug level, in milligrams. The level of the drug in the patient's bloodstream is a function of time,  $t$ , in hours, according to the formula  $g(t) = 300(0.8)^t$ . Find the value of  $h(g(t))$ , the patient's heart rate in beats per minute, to the nearest whole number.

21. The revenue,  $R(x)$ , from selling  $x$  units of a product is represented by the equation  $R(x) = 35x$ , while the total cost,  $C(x)$ , of making  $x$  units of the product is represented by the equation  $C(x) = 20x + 500$ . The total profit,  $P(x)$ , is represented by the equation  $P(x) = R(x) - C(x)$ . For the values of  $R(x)$  and  $C(x)$  given above, what is  $P(x)$ ?

- [A]  $15x$                                   [B]  $15x - 500$   
 [C]  $10x + 100$                          [D]  $15x + 500$

22. The cost ( $C$ ) of selling  $x$  calculators in a store is modeled by the equation

$$C = \frac{3,200,000}{x} + 60,000.$$

The store profit ( $P$ ) for these sales is modeled by the equation

$$P = 500x.$$

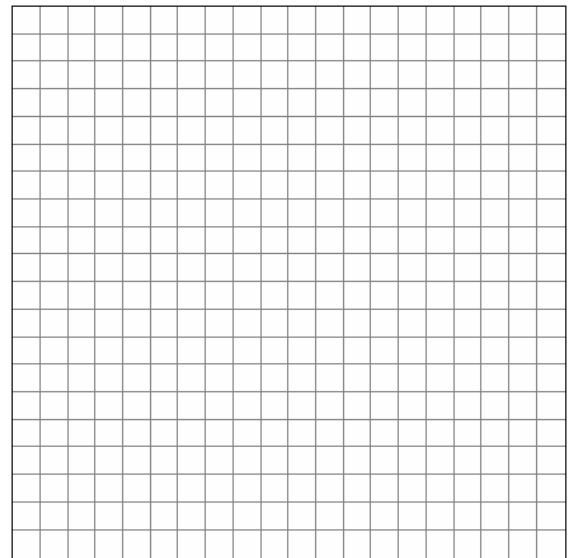
What is the minimum number of calculators that have to be sold for profit to be greater than cost?

23. A company calculates its profit by finding the difference between revenue and cost. The cost function of producing  $x$  hammers is  $C(x) = 4x + 170$ . If each hammer is sold for \$10, the revenue function for selling  $x$  hammers is  $R(x) = 10x$ . How many hammers must be sold to make a profit? How many hammers must be sold to make a profit of \$100?

24. The profit a coat manufacturer makes each day is modeled by the equation

$$P(x) = -x^2 + 120x - 2000,$$

where  $P$  is the profit and  $x$  is the price for each coat sold. For what values of  $x$  does the company make a profit? [The use of the accompanying grid is optional.]



## ADVANCED ALGEBRA

### CHAPTER 2-4

25. Which equation states that the temperature,  $t$ , in a room is less than  $3^\circ$  from  $68^\circ$ ?

- [A]  $|68 - t| < 3$                          [B]  $|68 + t| < 3$   
 [C]  $|3 + t| < 68$                          [D]  $|3 - t| < 68$

26. The solution set of  $|3x + 2| < 1$  contains

- [A] both positive and negative real numbers  
 [B] only negative real numbers  
 [C] only positive real numbers  
 [D] no real numbers

27. What is the solution set of the inequality

$$|3 - 2x| \geq 4?$$

[A]  $\{x | x \leq \frac{7}{2} \text{ or } x \geq \frac{1}{2}\}$

[B]  $\{x | -\frac{1}{2} \leq x \leq \frac{7}{2}\}$  [C]  $\{x | \frac{7}{2} \leq x \leq -\frac{1}{2}\}$

[D]  $\{x | x \leq -\frac{1}{2} \text{ or } x \geq \frac{7}{2}\}$

28. What is the solution of the inequality
- $|x + 3| \leq 5$
- ?

[A]  $-2 \leq x \leq 8$  [B]  $x \leq -8 \text{ or } x \geq 2$

[C]  $x \leq -2 \text{ or } x \geq 8$  [D]  $-8 \leq x \leq 2$

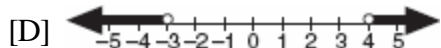
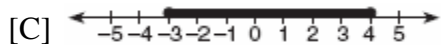
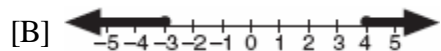
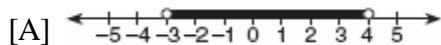
29. The solution of
- $|2x - 3| < 5$
- is

[A]  $-1 < x < 4$  [B]  $x > -1$

[C]  $x < 4$  [D]  $x < -1 \text{ or } x > 4$

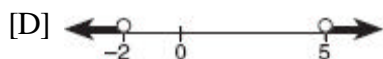
30. Which graph represents the solution set of

$$|2x - 1| < 7?$$



31. Which graph represents the solution set for the

expression  $|2x + 3| > 7$ ?



32. The inequality
- $|1.5C - 24| \leq 30$
- represents the range of monthly average temperatures,
- $C$
- , in degrees Celsius, for Toledo, Ohio. Solve for
- $C$
- .

33. A depth finder shows that the water in a certain place is 620 feet deep. The difference between
- $d$
- , the actual depth of the water, and the reading is
- $|d - 620|$
- and must be less than or equal to
- $0.05d$
- . Find the minimum and maximum values of
- $d$
- , to the nearest tenth of a foot.

34. The heights,
- $h$
- , of the students in the chorus at Central Middle School satisfy the inequality
- $\left| \frac{h - 57.5}{2} \right| \leq 3.25$
- , when
- $h$
- is measured in inches. Determine the interval in which these heights lie and express your answer to the nearest tenth of a foot. [Only an algebraic solution can receive full credit.]

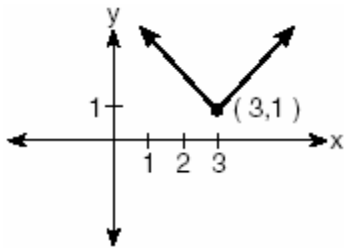
## ADVANCED ALGEBRA

### CHAPTER 2-5

35. The path of a rocket is represented by the equation
- $y = \sqrt{25 - x^2}$
- . The path of a missile designed to intersect the path of the rocket is represented by the equation
- $x = \frac{3}{2}\sqrt{y}$
- . The value of
- $x$
- at the point of intersection is 3. What is the corresponding value of
- $y$
- ?

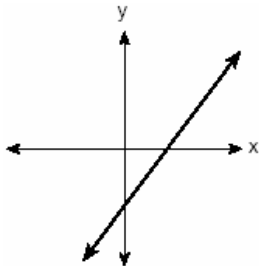
[A] -2 [B] 4 [C] -4 [D] 2

36. Which equation is represented by the accompanying graph?



- [A]  $y = |x + 3| - 1$       [B]  $y = |x - 3| + 1$   
 [C]  $y = |x| - 3$       [D]  $y = (x - 3)^2 + 1$

37. The graph below represents  $f(x)$ .



Which graph best represents  $|f(x)|$ ?

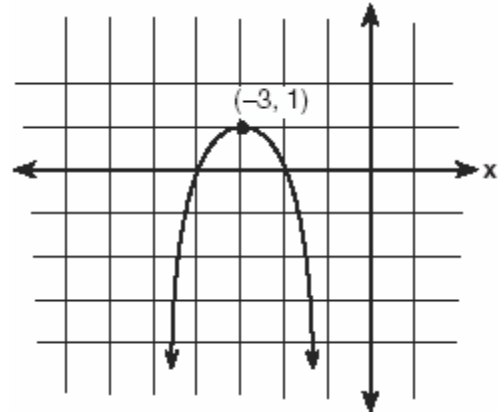
- [A] [B]   
 [C] [D]

38. Given the function  $y = f(x)$ , such that the entire graph of the function lies above the  $x$ -axis. Explain why the equation  $f(x) = 0$  has no real solutions.

## ADVANCED ALGEBRA

### CHAPTER 5-2

39. Which equation represents the parabola shown in the accompanying graph?



- [A]  $f(x) = (x + 1)^2 - 3$   
 [B]  $f(x) = -(x - 3)^2 + 1$   
 [C]  $f(x) = -(x + 3)^2 + 1$   
 [D]  $f(x) = -(x - 3)^2 - 3$

40. An archer shoots an arrow into the air such that its height at any time,  $t$ , is given by the function  $h(t) = -16t^2 + kt + 3$ . If the maximum height of the arrow occurs at time  $t = 4$ , what is the value of  $k$ ?

- [A] 128      [B] 64      [C] 4      [D] 8

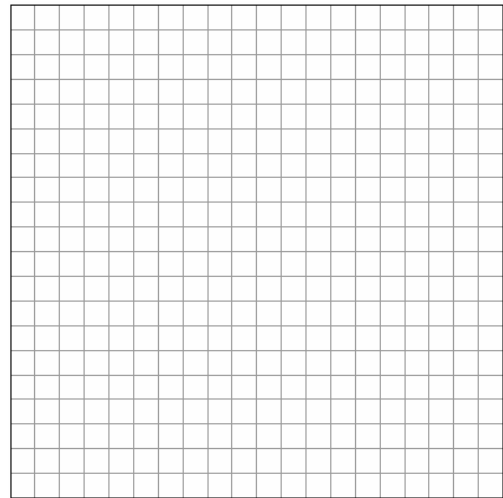
41. What is the turning point, or vertex, of the parabola whose equation is  $y = 3x^2 + 6x - 1$ ?

- [A] (3,44)      [B] (1,8)  
 [C] (-1,-4)      [D] (-3,8)

42. The height of an object,  $h(t)$ , is determined by the formula  $h(t) = -16t^2 + 256t$ , where  $t$  is time, in seconds. Will the object reach a maximum or a minimum? Explain or show your reasoning.

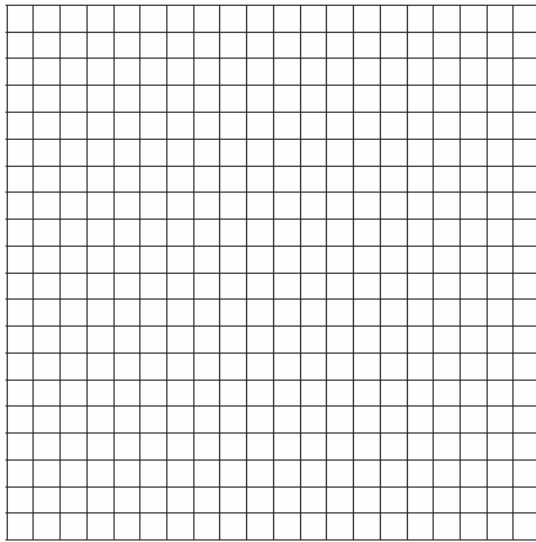
43. Vanessa throws a tennis ball in the air. The function  $h(t) = -16t^2 + 45t + 7$  represents the distance, in feet, that the ball is from the ground at any time  $t$ . At what time, to the *nearest tenth of a second*, is the ball at its maximum height?
44. The height,  $h$ , in feet, a ball will reach when thrown in the air is a function of time,  $t$ , in seconds, given by the equation  $h(t) = -16t^2 + 30t + 6$ . Find, to the *nearest tenth*, the maximum height, in feet, the ball will reach.
45. When a current,  $I$ , flows through a given electrical circuit, the power,  $W$ , of the circuit can be determined by the formula  $W = 120I - 12I^2$ . What amount of current,  $I$ , supplies the maximum power,  $W$ ?
46. The equation  $W = 120I - 12I^2$  represents the power ( $W$ ), in watts, of a 120-volt circuit having a resistance of 12 ohms when a current ( $I$ ) is flowing through the circuit. What is the maximum power, in watts, that can be delivered in this circuit?

47. A baseball player throws a ball from the outfield toward home plate. The ball's height above the ground is modeled by the equation  $y = -16x^2 + 48x + 6$  where  $y$  represents height, in feet, and  $x$  represents time, in seconds. The ball is initially thrown from a height of 6 feet. How many seconds after the ball is thrown will it again be 6 feet above the ground? What is the maximum height, in feet, that the ball reaches? [The use of the accompanying grid is optional.]





48. A rock is thrown vertically from the ground with a velocity of 24 meters per second, and it reaches a height of  $2 + 24t - 4.9t^2$  after  $t$  seconds. How many seconds after the rock is thrown will it reach maximum height, and what is the maximum height the rock will reach, in meters? How many seconds after the rock is thrown will it hit the ground? Round your answers to the *nearest hundredth*. [Only an algebraic or graphic solution will be accepted.]



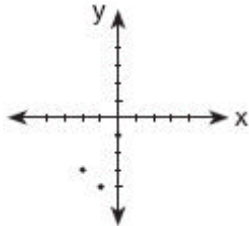
## ADVANCED ALGEBRA

### CHAPTER 5-4

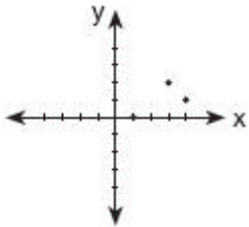
49. If a function is defined by the equation  $y = 3x + 2$ , which equation defines the inverse of this function?
- [A]  $y = \frac{1}{3}x + \frac{1}{2}$       [B]  $y = \frac{1}{3}x - \frac{2}{3}$
- [C]  $y = -3x - 2$       [D]  $x = \frac{1}{3}y + \frac{1}{2}$
50. A function is defined by the equation  $y = 5x - 5$ . Which equation defines the inverse of this function?
- [A]  $x = \frac{1}{5y - 5}$       [B]  $x = 5y - 5$
- [C]  $y = 5x + 5$       [D]  $y = \frac{1}{5x - 5}$
51. A function is defined by the equation  $y = \frac{1}{2}x - \frac{3}{2}$ . Which equation defines the inverse of this function?
- [A]  $y = 2x - \frac{3}{2}$       [B]  $y = 2x - 3$
- [C]  $y = 2x + 3$       [D]  $y = 2x + \frac{3}{2}$
52. Given:  $f(x) = x^2$  and  $g(x) = 2^x$
- a The inverse of  $g$  is a function, but the inverse of  $f$  is not a function. Explain why this statement is true.
- b Find  $g^{-1}(f(3))$  to the *nearest tenth*.
53. If the point  $(a, b)$  lies on the graph  $y = f(x)$ , the graph of  $y = f^{-1}(x)$  must contain point
- [A]  $(0, b)$       [B]  $(b, a)$
- [C]  $(a, 0)$       [D]  $(-a, -b)$

54. Which graph represents the inverse of  $f(x) = \{(0,1),(1,4),(2,3)\}$ ?

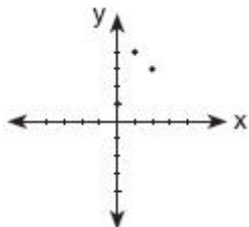
[A]



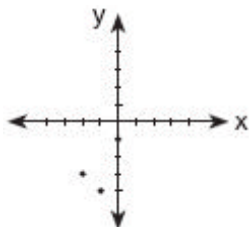
[B]



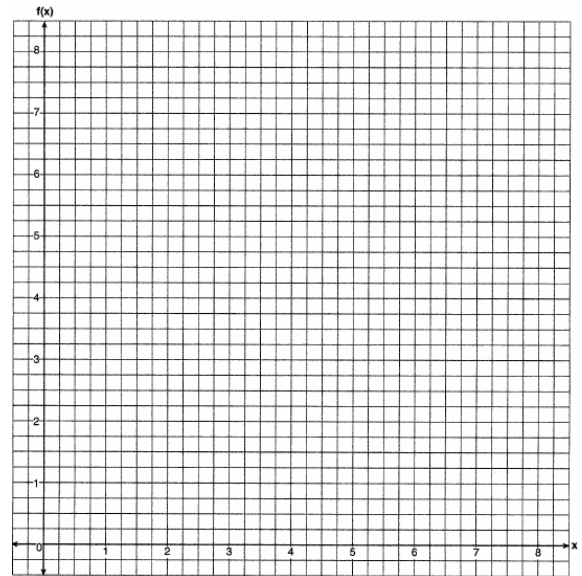
[C]



[D]



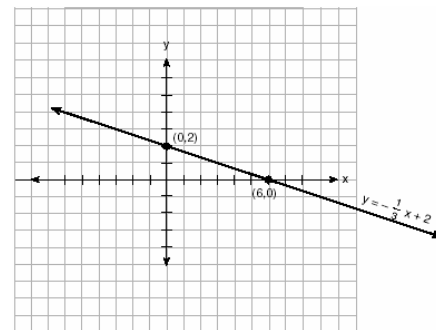
55. Draw  $f(x) = 2x^2$  and  $f^{-1}(x)$  in the interval  $0 \leq x \leq 2$  on the accompanying set of axes. State the coordinates of the points of intersection.



56. The accompanying diagram shows the graph of the line whose equation is  $y = -\frac{1}{3}x + 2$ .

On the same set of axes, sketch the graph of the inverse of this function.

State the coordinates of a point on the inverse function.



57. What is the inverse of the function  $y = \log_4 x$ ?

[A]  $y^4 = x$

[B]  $4^x = y$

[C]  $x^4 = y$

[D]  $4^y = x$

58. The inverse of a function is a logarithmic function in the form  $y = \log_b x$ . Which equation represents the original function?

- [A]  $by = x$                       [B]  $x = b^y$   
 [C]  $y = b^x$                       [D]  $y = bx$

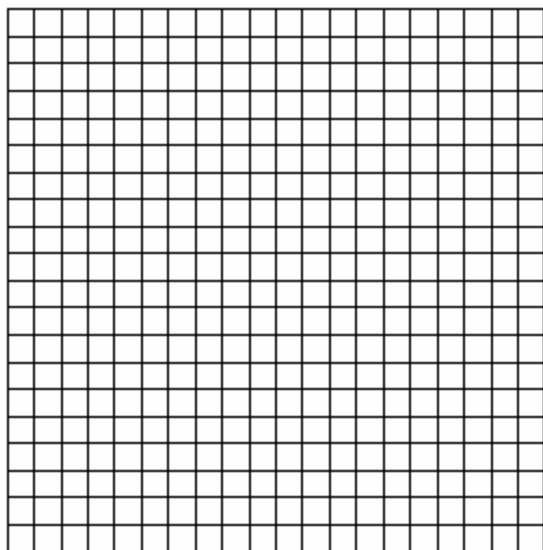
## ADVANCED ALGEBRA

### CHAPTER 5-5

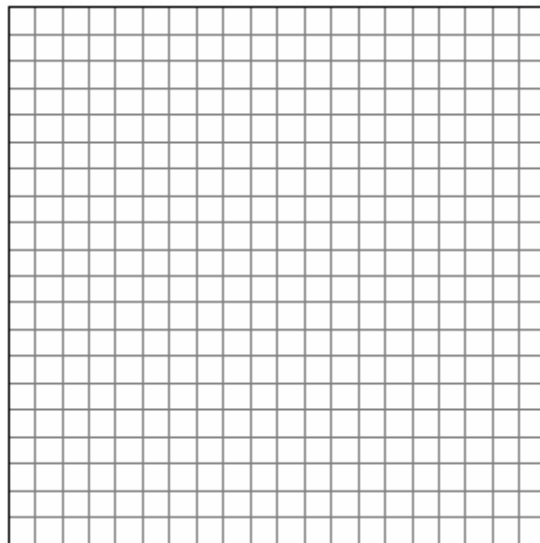
59. When a baseball is hit by a batter, the height of the ball,  $h(t)$ , at time  $t$ ,  $t \geq 0$ , is determined by the equation  $h(t) = -16t^2 + 64t + 4$ . For which interval of time is the height of the ball greater than or equal to 52 feet?

60. The profit,  $P$ , for manufacturing a wireless device is given by the equation

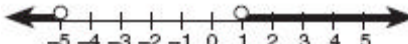
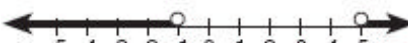


$P = -10x^2 + 750x - 9,000$ , where  $x$  is the selling price, in dollars, for each wireless device. What range of selling prices allows the manufacturer to make a profit on this wireless device? [The use of the grid is optional.]



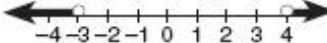
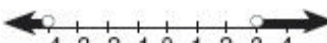


61. The height of a projectile is modeled by the equation  $y = -2x^2 + 38x + 10$ , where  $x$  is time, in seconds, and  $y$  is height, in feet. During what interval of time, to the *nearest tenth of a second*, is the projectile *at least* 125 feet above ground? [The use of the accompanying grid is optional.]



62. Which graph represents the solution set of the inequality  $x^2 - 4x - 5 < 0$ ?

- [A] 
- [B] 
- [C] 
- [D] 

63. Which graph represents the solution set of  $x^2 - x - 12 < 0$ ?

- [A] 
- [B] 
- [C] 
- [D] 

## ADVANCED ALGEBRA

### CHAPTER 5-6

64. Expressed in simplest form,  $i^{16} + i^6 - 2i^5 + i^{13}$  is equivalent to  
[A]  $-i$  [B]  $-1$  [C]  $i$  [D]  $1$
65. When simplified,  $i^{27} + i^{34}$  is equal to  
[A]  $i$  [B]  $-i-1$  [C]  $i-1$  [D]  $i^{61}$
66. What is the value of  $i^{99} - i^3$ ?  
[A]  $-i$  [B]  $1$  [C]  $0$  [D]  $i^{96}$
67. What is the sum of  $\sqrt{-2}$  and  $\sqrt{-18}$ ?  
[A]  $4i\sqrt{2}$  [B]  $5i\sqrt{2}$   
[C]  $2i\sqrt{5}$  [D]  $6i$
68. The expression  $i^0 \cdot i^1 \cdot i^2 \cdot i^3 \cdot i^4$  is equal to  
[A]  $i$  [B]  $-i$  [C]  $-1$  [D]  $1$
69. The expression  $\frac{i^{16}}{i^3}$  is equivalent to  
[A]  $1$  [B]  $-i$  [C]  $i$  [D]  $-1$
70. Express  $\sqrt{-48} + 3.5 + \sqrt{25} + \sqrt{-27}$  in simplest  $a + bi$  form.
71. What is the sum of  $2 - \sqrt{-4}$  and  $-3 + \sqrt{-16}$  expressed in simplest  $a + bi$  form?  
[A]  $-1 + 12i$  [B]  $-1 + i\sqrt{20}$   
[C]  $-1 + 2i$  [D]  $-14 + i$
72. What is the product of  $5 + \sqrt{-36}$  and  $1 - \sqrt{-49}$ , expressed in simplest  $a + bi$  form?  
[A]  $47 + 41i$  [B]  $5 - 71i$   
[C]  $47 - 29i$  [D]  $-37 + 41i$
73. When expressed as a monomial in terms of  $i$ ,  $2\sqrt{-32} - 5\sqrt{-8}$  is equivalent to  
[A]  $2i\sqrt{2}$  [B]  $2\sqrt{2}i$   
[C]  $18i\sqrt{2}$  [D]  $-2i\sqrt{2}$
74. The expression  $(-1+i)^3$  is equivalent to  
[A]  $-3i$  [B]  $-2 - 2i$   
[C]  $2 + 2i$  [D]  $-1 - i$
75. If  $f(x) = x^3 - 2x^2$ , then  $f(i)$  is equivalent to  
[A]  $2 - i$  [B]  $2 + i$  [C]  $-2 + i$  [D]  $-2 - i$
76. The expression  $\frac{2+i}{3+i}$  is equivalent to  
[A]  $\frac{6+i}{8}$  [B]  $\frac{7+i}{10}$   
[C]  $\frac{7-5i}{10}$  [D]  $\frac{6+5i}{8}$
77. What is the value of  $x$  in the equation  $\sqrt{5-2x} = 3i$ ?  
[A]  $4$  [B]  $1$  [C]  $-2$  [D]  $7$
78. Melissa and Joe are playing a game with complex numbers. If Melissa has a score of  $5 - 4i$  and Joe has a score of  $3 + 2i$ , what is their total score?  
[A]  $8 + 6i$  [B]  $8 - 2i$   
[C]  $8 + 2i$  [D]  $8 - 6i$
79. Show that the product of  $a + bi$  and its conjugate is a real number.

80. In an electrical circuit, the voltage,  $E$ , in volts, the current,  $I$ , in amps, and the opposition to the flow of current, called impedance,  $Z$ , in ohms, are related by the equation  $E = IZ$ . A circuit has a current of  $(3 + i)$  amps and an impedance of  $(-2 + i)$  ohms. Determine the voltage in  $a + bi$  form.

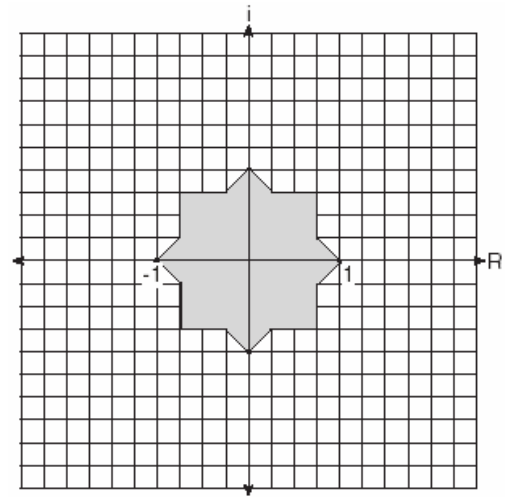
81. The relationship between voltage,  $E$ , current,  $I$ , and resistance,  $Z$ , is given by the equation  $E = IZ$ . If a circuit has a current  $I = 3 + 2i$  and a resistance  $Z = 2 - i$ , what is the voltage of this circuit?

- [A]  $4 + i$     [B]  $4 - i$     [C]  $8 + 7i$     [D]  $8 + i$

82. Impedance measures the opposition of an electrical circuit to the flow of electricity. The total impedance in a particular circuit is given by the formula  $Z_T = \frac{Z_1 Z_2}{Z_1 + Z_2}$ . What is the total impedance of a circuit,  $Z_T$ , if  $Z_1 = 1 + 2i$  and  $Z_2 = 1 - 2i$ ?

- [A] 0    [B] 1    [C]  $\frac{5}{2}$     [D]  $-\frac{3}{2}$

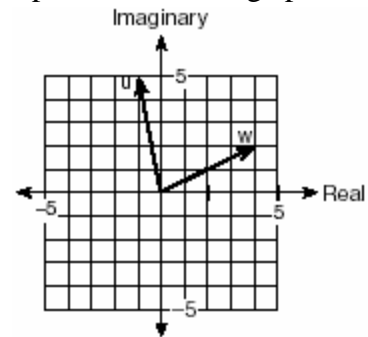
83. Fractal geometry uses the complex number plane to draw diagrams, such as the one shown in the accompanying graph.



Which number is *not* included in the shaded area?

- [A]  $-0.9$     [B]  $-0.9 - 0.9i$   
 [C]  $-0.5i$     [D]  $-0.5 - 0.5i$

84. Two complex numbers are graphed below.



What is the sum of  $w$  and  $u$ , expressed in standard complex number form?

- [A]  $5 + 7i$     [B]  $-5 + 3i$   
 [C]  $7 + 3i$     [D]  $3 + 7i$

## ADVANCED ALGEBRA CHAPTER 5-8

85. If the sum of the roots of  $x^2 + 3x - 5$  is added to the product of its roots, the result is

- [A] -15    [B] -8    [C] 15    [D] -2

86. Express, in simplest  $a + bi$  form, the roots of the equation  $x^2 + 5 = 4x$ .
87. Solve for  $x$  in simplest  $a + bi$  form:  
 $x^2 + 8x + 25 = 0$
88. Jacob is solving a quadratic equation. He executes a program on his graphing calculator and sees that the roots are real, rational, and unequal. This information indicates to Jacob that the discriminant is  
[A] not a perfect square      [B] zero  
[C] negative      [D] a perfect square
89. The roots of the equation  $x^2 - 3x - 2 = 0$  are  
[A] real, irrational, and unequal  
[B] real, rational, and equal  
[C] real, rational, and unequal  
[D] imaginary
90. The roots of a quadratic equation are real, rational, and equal when the discriminant is  
[A] 4      [B] -2      [C] 0      [D] 2
91. Which equation has imaginary roots?  
[A]  $x^2 - 1 = 0$       [B]  $x^2 - x - 1 = 0$   
[C]  $x^2 + x + 1 = 0$       [D]  $x^2 - 2 = 0$
92. The roots of the equation  $ax^2 + 4x = -2$  are real, rational, and equal when  $a$  has a value of  
[A] 1      [B] 4      [C] 2      [D] 3
93. In the equation  $ax^2 + 6x - 9 = 0$ , imaginary roots will be generated if  
[A]  $-1 < a < 1$       [B]  $a > -1$ , only  
[C]  $a < 1$ , only      [D]  $a < -1$
94. The equation  $2x^2 + 8x + n = 0$  has imaginary roots when  $n$  is equal to  
[A] 8      [B] 6      [C] 10      [D] 4
95. The roots of the equation  $2x^2 - 8x - 4 = 0$  are  
[A] real, irrational, and unequal  
[B] real, rational, and unequal  
[C] imaginary      [D] real, rational, and equal
96. The roots of the equation  $2x^2 - x = 4$  are  
[A] real, rational, and equal  
[B] imaginary      [C] real and irrational  
[D] real, rational, and unequal
97. Which statement must be true if a parabola represented by the equation  $y = ax^2 + bx + c$  does not intersect the  $x$ -axis?  
[A]  $b^2 - 4ac = 0$       [B]  $b^2 - 4ac < 0$   
[C]  $b^2 - 4ac > 0$ , and  $b^2 - 4ac$  is not a perfect square.  
[D]  $b^2 - 4ac > 0$ , and  $b^2 - 4ac$  is a perfect square.
98. For which positive value of  $m$  will the equation  $4x^2 + mx + 9 = 0$  have roots that are real, equal, and rational?  
[A] 3      [B] 9      [C] 12      [D] 4
99. If the roots of  $ax^2 + bx + c = 0$  are real, rational, and equal, what is true about the graph of the function  $y = ax^2 + bx + c$ ?  
[A] It is tangent to the  $x$ -axis.  
[B] It intersects the  $x$ -axis in two distinct points.  
[C] It lies entirely below the  $x$ -axis.  
[D] It lies entirely above the  $x$ -axis.

100. Find all values of  $k$  such that the equation  $3x^2 - 2x + k = 0$  has imaginary roots.
101. If  $2 + 3i$  is one root of a quadratic equation with real coefficients, what is the sum of the roots of the equation?
102. Which equation has imaginary roots?
- [A]  $x(x + 6) = -10$       [B]  $x(5 - x) = -3$   
 [C]  $x(5 + x) = 8$       [D]  $(2x + 1)(x - 3) = 7$

## ADVANCED ALGEBRA

### CHAPTER 6-1

103. The value of  $\left(\frac{3^0}{27^{\frac{2}{3}}}\right)^{-1}$  is
- [A] 9      [B]  $\frac{1}{9}$       [C]  $-\frac{1}{9}$       [D] -9
104. The expression  $\frac{3^{\frac{1}{3}}}{3^{\frac{2}{3}}}$  is equivalent to
- [A] 1      [B] 3      [C]  $\sqrt{3}$       [D]  $\frac{1}{\sqrt[3]{3}}$
105. If  $x$  is a positive integer,  $4x^{\frac{1}{2}}$  is equivalent to
- [A]  $4\frac{1}{x}$       [B]  $2x$       [C]  $4\sqrt{x}$       [D]  $\frac{2}{x}$
106. The expression  $b^{-\frac{3}{2}}$ ,  $b > 0$ , is equivalent to
- [A]  $-(\sqrt{b})^3$       [B]  $\frac{1}{(\sqrt{b})^3}$   
 [C]  $(\sqrt[3]{b})^2$       [D]  $\frac{1}{(\sqrt[3]{b})^2}$

107. The expression  $\sqrt[4]{16a^6b^4}$  is equivalent to
- [A]  $4a^2b$       [B]  $2a^2b$   
 [C]  $2a^{\frac{3}{2}}b$       [D]  $4a^{\frac{3}{2}}b$
108. Find the value of  $(x + 2)^0 + (x + 1)^{-\frac{2}{3}}$  when  $x = 7$ .
109. If  $(a^x)^{\frac{2}{3}} = \frac{1}{a^2}$ , what is the value of  $x$ ?
- [A] 2      [B] -1      [C] 1      [D] -3

110. Meteorologists can determine how long a storm lasts by using the function  $t(d) = 0.07d^{\frac{3}{2}}$ , where  $d$  is the diameter of the storm, in miles, and  $t$  is the time, in hours. If the storm lasts 4.75 hours, find its diameter, to the *nearest tenth of a mile*.

## ADVANCED ALGEBRA

### CHAPTER 6-7

111. What is the *last* term in the expansion of  $(x + 2y)^5$ ?
- [A]  $32y^5$       [B]  $y^5$       [C]  $2y^5$       [D]  $10y^5$
112. What is the middle term in the expansion of  $(x + y)^4$ ?
- [A]  $4x^2y^2$       [B]  $6x^2y^2$   
 [C]  $x^2y^2$       [D]  $2x^2y^2$
113. What is the third term in the expansion of  $(\cos x + 3)^5$ ?
- [A]  $270\cos^2 x$       [B]  $60\cos^3 x$   
 [C]  $90\cos^3 x$       [D]  $90\cos^2 x$













147. If  $\log a = 2$  and  $\log b = 3$ , what is the numerical value of  $\log \frac{\sqrt{a}}{b^3}$ ?
- [A] 8      [B] -8      [C] -25      [D] 25
148. If  $\log x = a$ ,  $\log y = b$ , and  $\log z = c$ , then  $\log \frac{x^2 y}{\sqrt{z}}$  is equivalent to
- [A]  $a^2 + b - \frac{1}{2}c$       [B]  $42a + b + \frac{1}{2}c$   
 [C]  $2ab - \frac{1}{2}c$       [D]  $2a + b - \frac{1}{2}c$
149. The expression  $\log 10^{x+2} - \log 10^x$  is equivalent to
- [A] 2      [B] 100      [C]  $\frac{1}{100}$       [D] -2
150. If  $\log a = x$  and  $\log b = y$ , what is  $\log a\sqrt{b}$ ?
- [A]  $x + \frac{y}{2}$       [B]  $x + 2y$   
 [C]  $\frac{x+y}{2}$       [D]  $2x + 2y$
151. If  $\log k = c \log v + \log p$ ,  $k$  equals
- [A]  $v^c p$       [B]  $cv + p$   
 [C]  $(vp)^c$       [D]  $v^c + p$
152. Solve for  $x$ :  $\log_4(x^2 + 3x) - \log_4(x + 5) = 1$
153. In the equation  $\log_x 4 + \log_x 9 = 2$ ,  $x$  is equal to
- [A] 6.5      [B]  $\sqrt{13}$       [C] 6      [D] 18
154. If  $\log_5 x = 2$ , what is the value of  $\sqrt{x}$ ?
- [A] 5      [B]  $2^{\frac{2}{5}}$       [C]  $\sqrt{5}$       [D] 25
155. The relationship between the relative size of an earthquake,  $S$ , and the measure of the earthquake on the Richter scale,  $R$ , is given by the equation  $\log S = R$ . If an earthquake measured 3.2 on the Richter scale, what was its relative size to the *nearest hundredth*?
156. The magnitude ( $R$ ) of an earthquake is related to its intensity ( $I$ ) by  $R = \log\left(\frac{I}{T}\right)$ , where  $T$  is the threshold below which the earthquake is not noticed. If the intensity is doubled, its magnitude can be represented by
- [A]  $2(\log I - \log T)$       [B]  $\log I - \log T$   
 [C]  $2 \log I - \log T$       [D]  $\log 2 + \log I - \log T$
157. The scientists in a laboratory company raise amebas to sell to schools for use in biology classes. They know that one ameba divides into two amebas every hour and that the formula  $t = \log_2 N$  can be used to determine how long in hours,  $t$ , it takes to produce a certain number of amebas,  $N$ . Determine, to the *nearest tenth of an hour*, how long it takes to produce 10,000 amebas if they start with one ameba.

## ADVANCED ALGEBRA

### CHAPTER 7-5

158. What is the value of  $x$  in the equation  $81^{x+2} = 27^{5x+4}$ ?
- [A]  $-\frac{2}{11}$       [B]  $\frac{4}{11}$       [C]  $-\frac{4}{11}$       [D]  $-\frac{3}{2}$
159. The growth of bacteria in a dish is modeled by the function  $f(t) = 2^{\frac{t}{3}}$ . For which value of  $t$  is  $f(t) = 32$ ?
- [A] 8      [B] 15      [C] 2      [D] 16
160. Solve algebraically for  $x$ :  $27^{2x+1} = 9^{4x}$

161. Determine the value of  $x$  and  $y$  if  $2^y = 8^x$  and  $3^y = 3^{x+4}$ .
- [A]  $x = -2, y = -6$       [B]  $x = 2, y = 6$   
 [C]  $x = 6, y = 2$       [D]  $x = y$
162. Solve for  $m$ :  $3^{m+1} - 5 = 22$
163. The Franklins inherited \$3,500, which they want to invest for their child's future college expenses. If they invest it at 8.25% with interest compounded monthly, determine the value of the account, in dollars, after 5 years. Use the formula  $A = P\left(1 + \frac{r}{n}\right)^{nt}$ , where  $A$  = value of the investment after  $t$  years,  $P$  = principal invested,  $r$  = annual interest rate, and  $n$  = number of times compounded per year.
164. Depreciation (the decline in cash value) on a car can be determined by the formula  $V = C(1 - r)^t$ , where  $V$  is the value of the car after  $t$  years,  $C$  is the original cost, and  $r$  is the rate of depreciation. If a car's cost, when new, is \$15,000, the rate of depreciation is 30%, and the value of the car now is \$3,000, how old is the car to the *nearest tenth of a year*?
165. The amount  $A$ , in milligrams, of a 10-milligram dose of a drug remaining in the body after  $t$  hours is given by the formula  $A = 10(0.8)^t$ . Find, to the *nearest tenth of an hour*, how long it takes for half of the drug dose to be left in the body.
166. Growth of a certain strain of bacteria is modeled by the equation  $G = A(2.7)^{0.584t}$ , where:  
 $G$  = final number of bacteria  
 $A$  = initial number of bacteria  
 $t$  = time (in hours)  
 In approximately how many hours will 4 bacteria first increase to 2,500 bacteria? Round your answer to the *nearest hour*.
167. The equation for radioactive decay is  $p = (0.5)^{\frac{t}{H}}$ , where  $p$  is the part of a substance with half-life  $H$  remaining radioactive after a period of time,  $t$ .  
 A given substance has a half-life of 6,000 years. After  $t$  years, one-fifth of the original sample remains radioactive. Find  $t$ , to the *nearest thousand years*.
168. An archaeologist can determine the approximate age of certain ancient specimens by measuring the amount of carbon-14, a radioactive substance, contained in the specimen. The formula used to determine the age of a specimen is  $A = A_0 2^{\frac{-t}{5760}}$ , where  $A$  is the amount of carbon-14 that a specimen contains,  $A_0$  is the original amount of carbon-14,  $t$  is time, in years, and 5760 is the half-life of carbon-14.  
 A specimen that originally contained 120 milligrams of carbon-14 now contains 100 milligrams of this substance. What is the age of the specimen, to the *nearest hundred years*?







# ADVANCED ALGEBRA

## CHAPTER 8-4

185. Written in simplest form, the expression

$$\frac{x^2y^2-9}{3-xy} \text{ is equivalent to}$$

- [A]  $3+xy$                       [B]  $\frac{1}{3+xy}$   
[C]  $-(3+xy)$                 [D]  $-1$

186. Express the following rational expression in simplest form:

$$\frac{9-x^2}{10x^2-28x-6}$$

187. For all values of  $x$  for which the expression is

defined,  $\frac{2x+x^2}{x^2+5x+6}$  is equivalent to

- [A]  $\frac{1}{x+2}$                       [B]  $\frac{x}{x+2}$   
[C]  $\frac{1}{x+3}$                       [D]  $\frac{x}{x+3}$

188. Written in simplest form, the expression

$$\frac{x^2-9x}{45x-5x^2} \text{ is equivalent to}$$

- [A]  $\frac{1}{5}$     [B]  $-\frac{1}{5}$     [C]  $-5$     [D]  $5$

189. The expression  $\frac{\frac{a-b}{\frac{b-a}{\frac{1}{a}+\frac{1}{b}}}}$  is equivalent to

- [A]  $\frac{a-b}{ab}$                       [B]  $a-b$   
[C]  $ab$                         [D]  $a+b$

190. The fraction  $\frac{\frac{x}{y}+x}{\frac{1}{y}+1}$  is equivalent to

- [A]  $2x$     [B]  $x$     [C]  $\frac{x^2y}{1+y}$     [D]  $\frac{2xy}{1+y}$

191. In simplest form,  $\frac{\frac{1}{x^2}-\frac{1}{y^2}}{\frac{1}{y}+\frac{1}{x}}$  is equal to

- [A]  $y-x$                       [B]  $\frac{x-y}{xy}$   
[C]  $\frac{y-x}{xy}$                       [D]  $x-y$

192. Express in simplest form:  $\frac{\frac{x-4}{4}-\frac{x}{4}}{1-\frac{4}{x}}$

193. The expression  $\frac{\frac{1}{x}+\frac{1}{y}}{\frac{1}{x^2}-\frac{1}{y^2}}$  is equivalent to

- [A]  $y-x$                       [B]  $\frac{y-x}{xy}$   
[C]  $\frac{xy}{x-y}$                       [D]  $\frac{xy}{y-x}$

194. Which expression is equivalent to the complex

$$\text{fraction } \frac{\frac{x}{x+2}}{1-\frac{x}{x+2}}?$$

- [A]  $\frac{2}{x}$     [B]  $\frac{2x}{x+2}$     [C]  $\frac{x}{2}$     [D]  $\frac{2x}{x^2+4}$

195. When simplified, the complex fraction

$$\frac{1 + \frac{1}{x}}{\frac{1}{x} - x}, x \neq 0, \text{ is equivalent to}$$

[A]  $\frac{1}{1-x}$     [B] 1    [C] -1    [D]  $\frac{1}{x-1}$

196. Express in simplest form:
- $\frac{\frac{1}{r} + \frac{1}{s}}{\frac{r^2}{s^2} - 1}$

197. In a science experiment, when resistor
- $A$
- and resistor
- $B$
- are connected in a parallel circuit, the total resistance is
- $\frac{1}{\frac{1}{A} + \frac{1}{B}}$
- . This complex fraction is equivalent to

[A] 1    [B]  $\frac{AB}{A+B}$     [C]  $AB$     [D]  $A+B$

## ADVANCED ALGEBRA

### CHAPTER 8-5

198. What is the sum of
- $\frac{3}{x-3}$
- and
- $\frac{x}{3-x}$
- ?

[A] 0    [B] 1    [C] -1    [D]  $\frac{x+3}{x-3}$

199. What is the sum of
- $(y-5) + \frac{3}{y+2}$
- ?

[A]  $\frac{y^2 - 3y - 7}{y+2}$     [B]  $\frac{y-2}{y+2}$

[C]  $y-5$     [D]  $\frac{y^2 - 7}{y+2}$

200. Express in simplest form:
- $\frac{1}{x} + \frac{1}{x+3}$

201. A rectangular prism has a length of
- $\frac{2x^2 + 2x - 24}{4x^2 + x}$
- , a width of
- $\frac{x^2 + x - 6}{x+4}$
- , and a height of
- $\frac{8x^2 + 2x}{x^2 - 9}$
- . For all values of
- $x$
- for which it is defined, express, in terms of
- $x$
- , the volume of the prism in simplest form.

202. If the length of a rectangular garden is represented by
- $\frac{x^2 + 2x}{x^2 + 2x - 15}$
- and its width is represented by
- $\frac{2x - 6}{2x + 4}$
- , which expression represents the area of the garden?

[A]  $x$     [B]  $\frac{x^2 + 2x}{2(x+5)}$

[C]  $\frac{x}{x+5}$     [D]  $x+5$

203. Express in simplest form:

$$\frac{4x+8}{x+1} \cdot \frac{2-x}{3x-15} \div \frac{x^2-4}{2x^2-8x-10}$$

## ADVANCED ALGEBRA

### CHAPTER 8-6

204. A rectangle is said to have a golden ratio when
- $\frac{w}{h} = \frac{h}{w-h}$
- , where
- $w$
- represents width and
- $h$
- represents height. When
- $w = 3$
- , between which two consecutive integers will
- $h$
- lie?

205. What is the solution set of the equation

$$\frac{x}{x-4} - \frac{1}{x+3} = \frac{28}{x^2 - x - 12}?$$

[A]  $\{-6\}$     [B]  $\{4, -6\}$     [C]  $\{\}$     [D]  $\{4\}$

















257. If  $x$  is an acute angle and  $\sin x = \frac{12}{13}$ , then  $\cos 2x$  equals
- [A]  $-\frac{25}{169}$       [B]  $\frac{119}{169}$   
 [C]  $-\frac{119}{169}$       [D]  $\frac{25}{169}$
258. If  $q$  is an acute angle such that  $\sin q = \frac{5}{13}$ , what is the value of  $\sin 2q$ ?
- [A]  $\frac{10}{26}$     [B]  $\frac{120}{169}$     [C]  $\frac{12}{13}$     [D]  $\frac{60}{169}$
259. If  $\sin q = \frac{\sqrt{5}}{3}$ , then  $\cos 2q$  equals
- [A]  $-\frac{1}{3}$     [B]  $-\frac{1}{9}$     [C]  $\frac{1}{9}$     [D]  $\frac{1}{3}$
260. If  $A$  and  $B$  are positive acute angles,  $\sin A = \frac{5}{13}$ , and  $\cos B = \frac{4}{5}$ , what is the value of  $\sin(A+B)$ ?
- [A]  $-\frac{16}{65}$     [B]  $\frac{63}{65}$     [C]  $\frac{33}{65}$     [D]  $\frac{56}{65}$
261. On a monitor, the graphs of two impulses are recorded on the same screen, where  $0^\circ \leq x < 360^\circ$ . The impulses are given by the following equations:
- $$y = 2 \sin^2 x$$
- $$y = 1 - \sin x$$
- Find all values of  $x$ , in degrees, for which the two impulses meet in the interval  $0^\circ \leq x < 360^\circ$ . [Only an algebraic solution will be accepted.]
262. If  $\sec x - 2 \sec x - 1 = 0$ , then  $x$  terminates in
- [A] Quadrants I, II, III, and IV  
 [B] Quadrant I, only  
 [C] Quadrants I and II, only  
 [D] Quadrants I and IV, only
263. If  $\sin 6A = \cos 9A$ , then  $m\angle A$  is equal to
- [A] 36    [B] 6    [C] 54    [D]  $1\frac{1}{2}$
264. What value of  $x$  in the interval  $0^\circ \leq x \leq 180^\circ$  satisfies the equation  $\sqrt{3} \tan x + 1 = 0$ ?
- [A]  $60^\circ$     [B]  $30^\circ$     [C]  $150^\circ$     [D]  $-30^\circ$
265. The expression  $\cos 40^\circ \cos 10^\circ + \sin 40^\circ \sin 10^\circ$  is equivalent to
- [A]  $\cos 50^\circ$       [B]  $\sin 30^\circ$   
 [C]  $\sin 50^\circ$       [D]  $\cos 30^\circ$
266. What is a positive value of  $x$  for which  $9^{-\cos x} = \frac{1}{3}$ ?
- [A]  $30^\circ$     [B]  $45^\circ$     [C]  $60^\circ$     [D]  $90^\circ$
267. Navigators aboard ships and airplanes use nautical miles to measure distance. The length of a nautical mile varies with latitude. The length of a nautical mile,  $L$ , in feet, on the latitude line  $q$  is given by the formula  $L = 6,077 - 31 \cos 2q$ . Find, to the nearest degree, the angle  $q$ ,  $0 \leq q \leq 90^\circ$ , at which the length of a nautical mile is approximately 6,076 feet.
268. Solve algebraically for all values of  $q$  in the interval  $0^\circ \leq q \leq 360^\circ$  that satisfy the equation  $\frac{\sin^2 q}{1 + \cos q} = 1$ .















310. An electronics company produces a headphone set that can be adjusted to accommodate different-sized heads. Research into the distance between the top of people's heads and the top of their ears produced the following data, in inches: 4.5, 4.8, 6.2, 5.5, 5.6, 5.4, 5.8, 6.0, 5.8, 6.2, 4.6, 5.0, 5.4, 5.8
- The company decides to design their headphones to accommodate three standard deviations from the mean. Find, to the *nearest tenth*, the mean, the standard deviation, and the range of distances that must be accommodated.
311. Jean's scores on five mathematics tests were 98, 97, 99, 98, and 96. Her scores on five English tests were 78, 84, 95, 72, and 79. Which statement is true about the standard deviations for the scores?
- [A] More information is needed to determine the relationship between the standard deviations.
- [B] The standard deviations for both sets of scores are equal.
- [C] The standard deviation for the English scores is greater than the standard deviation for the math scores.
- [D] The standard deviation for the math scores is greater than the standard deviation for the English scores.
313. Professor Bartrich has 184 students in her mathematics class. The scores on the final examination are normally distributed and have a mean of 72.3 and a standard deviation of 8.9. How many students in the class can be expected to receive a score between 82 and 90?
314. In a New York City high school, a survey revealed the mean amount of cola consumed each week was 12 bottles and the standard deviation was 2.8 bottles. Assuming the survey represents a normal distribution, how many bottles of cola per week will approximately 68.2% of the students drink?
- [A] 6.4 to 12                      [B] 6.4 to 17.6
- [C] 9.2 to 14.8                    [D] 12 to 20.4
315. The amount of ketchup dispensed from a machine at Hamburger Palace is normally distributed with a mean of 0.9 ounce and a standard deviation of 0.1 ounce. If the machine is used 500 times, approximately how many times will it be expected to dispense 1 or more ounces of ketchup?
- [A] 80      [B] 100      [C] 16      [D] 5
316. The amount of juice dispensed from a machine is normally distributed with a mean of 10.50 ounces and a standard deviation of 0.75 ounce. Which interval represents the amount of juice dispensed about 68.2% of the time?
- [A] 9.00-12.00                    [B] 9.75-11.25
- [C] 10.50-11.25                    [D] 9.75-10.50
317. The mean of a normally distributed set of data is 56, and the standard deviation is 5. In which interval do approximately 95.4% of all cases lie?
- [A] 56-71                          [B] 46-56
- [C] 51-61                          [D] 46-66

## ADVANCED ALGEBRA

### CHAPTER 11-7

312. In a certain school district, the ages of all new teachers hired during the last 5 years are normally distributed. Within this curve, 95.4% of the ages, centered about the mean, are between 24.6 and 37.4 years. Find the mean age and the standard deviation of the data.

318. Twenty high school students took an examination and received the following scores:  
70, 60, 75, 68, 85, 86, 78, 72, 82, 88, 88, 73, 74, 79, 86, 82, 90, 92, 93, 73  
Determine what percent of the students scored within one standard deviation of the mean. Do the results of the examination approximate a normal distribution? Justify your answer.
319. The national mean for verbal scores on an exam was 428 and the standard deviation was 113. Approximately what percent of those taking this test had verbal scores between 315 and 541?  
[A] 68.2%                      [B] 38.2%  
[C] 26.4%                      [D] 52.8%
320. Battery lifetime is normally distributed for large samples. The mean lifetime is 500 days and the standard deviation is 61 days. Approximately what percent of batteries have lifetimes *longer than* 561 days?  
[A] 16%    [B] 34%    [C] 68%    [D] 84%
321. From 1984 to 1995, the winning scores for a golf tournament were 276, 279, 279, 277, 278, 278, 280, 282, 285, 272, 279, and 278. Using the standard deviation for the sample,  $S_x$ , find the percent of these winning scores that fall within one standard deviation of the mean.
322. On a standardized test, the distribution of scores is normal, the mean of the scores is 75, and the standard deviation is 5.8. If a student scored 83, the student's score ranks  
[A] below the 75th percentile  
[B] between the 75th percentile and the 84th percentile  
[C] above the 97th percentile  
[D] between the 84th percentile and the 97th percentile
323. The mean score on a normally distributed exam is 42 with a standard deviation of 12.1. Which score would be expected to occur less than 5% of the time?  
[A] 67    [B] 32    [C] 25    [D] 60
324. Mrs. Ramírez is a real estate broker. Last month, the sale prices of homes in her area approximated a normal distribution with a mean of \$150,000 and a standard deviation of \$25,000.  
A house had a sale price of \$175,000. What is the percentile rank of its sale price, to the *nearest whole number*? Explain what that percentile means.  
Mrs. Ramírez told a customer that most of the houses sold last month had selling prices between \$125,000 and \$175,000. Explain why she is correct.
325. A set of normally distributed student test scores has a mean of 80 and a standard deviation of 4. Determine the probability that a randomly selected score will be between 74 and 82.
326. The amount of time that a teenager plays video games in any given week is normally distributed. If a teenager plays video games an average of 15 hours per week, with a standard deviation of 3 hours, what is the probability of a teenager playing video games between 15 and 18 hours a week?

327. A shoe manufacturer collected data regarding men's shoe sizes and found that the distribution of sizes exactly fits the normal curve. If the mean shoe size is 11 and the standard deviation is 1.5, find:

*a* the probability that a man's shoe size is greater than or equal to 11

*b* the probability that a man's shoe size is greater than or equal to 12.5

*c*  $\frac{P(\text{size} \geq 12.5)}{P(\text{size} \geq 8)}$

## ADVANCED ALGEBRA

### CHAPTER 12-4

328. What is the value of  $\sum_{m=1}^3 (2m+1)^{m-1}$  ?

- [A] 55    [B] 57    [C] 15    [D] 245

329. What is the value of  $\sum_{m=2}^5 (m^2 - 1)$ ?

- [A] 58    [B] 53    [C] 50    [D] 54

330. Evaluate:  $2 \sum_{n=1}^5 (2n-1)$

331. Evaluate:  $\sum_{n=1}^5 (n^2 + n)$

332. The projected total annual profits, in dollars, for the Nutyme Clothing Company from 2002 to 2004 can be approximated by the model

$$\sum_{n=0}^2 (13,567n + 294), \text{ where } n \text{ is the year and}$$

$n = 0$  represents 2002. Use this model to find the company's projected total annual profits, in dollars, for the period 2002 to 2004.

333. A ball is dropped from a height of 8 feet and allowed to bounce. Each time the ball bounces, it bounces back to half its previous height. The vertical distance the ball travels, *d*, is given by the

formula  $d = 8 + 16 \sum_{k=1}^n \left(\frac{1}{2}\right)^k$ , where *n* is the

number of bounces. Based on this formula, what is the total vertical distance that the ball has traveled after four bounces?

- [A] 23.0 ft                      [B] 22.0 ft  
[C] 15.0 ft                      [D] 8.9 ft

334. If  ${}_n C_r$  represents the number of combinations of *n* items taken *r* at a time, what is the value of

$$\sum_{r=1}^3 {}_4 C_r ?$$

- [A] 24    [B] 6    [C] 4    [D] 14

335. The value of  $\sum_{r=2}^4 {}_5 C_r$  is

- [A] 5    [B] 25    [C] 10    [D] 45

336. Evaluate:  $\sum_{k=0}^3 \{3 \cos k\pi + 1\}$

337. What is the value of  $\sum_{b=0}^3 (2 - (b)i)$  ?

- [A]  $8-5i$     [B]  $8-6i$     [C]  $2-5i$     [D]  $2-6i$