MAC 1105 FINAL Exam REVIEW

Name___________________________________

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

Find the product and write the result in standard form.

1) $(6 - 3i)(-4 - 6i)$ 1) _______________

Solve the equation by factoring.

2) $8x^2 - 47x = 6$ 2) _______________

3) $8x^2 - 55x = 7$ 3) _______________

4) $6x^2 + 23x + 20 = 0$ 4) _______________

Solve the equation by completing the square.

5) $16x^2 - 7x + 1 = 0$ 5) _______________

6) $x^2 + 12x + 22 = 0$ 6) _______________

Perform the indicated operations and write the result in standard form.

7) $(4 + \sqrt{-3})(4 + \sqrt{-7})$ 7) _______________

Solve the equation using the quadratic formula.

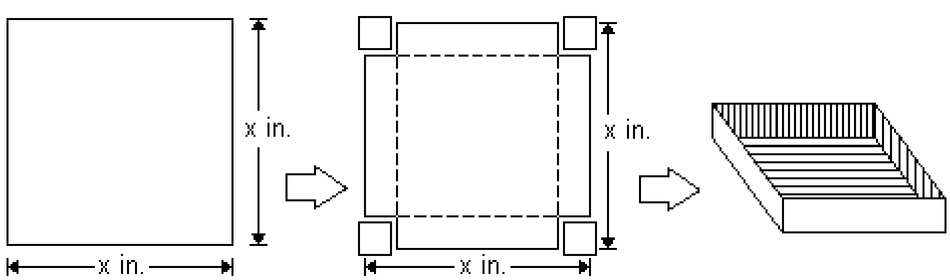
8) $5x^2 = -12x - 6$ 8) _______________

Solve the equation by factoring.

9) $25x^2 + 25x + 6 = 0$ 9) _______________

Solve the problem.

10) Suppose that an open box is to be made from a square sheet of cardboard by cutting out 2-inch squares from each corner as shown and then folding along the dotted lines. If the box is to have a volume of 128 cubic inches, find the original dimensions of the sheet of cardboard. 10) _______________



Determine ALGEBRAICALLY whether the given function is even, odd, or neither.

11) $f(x) = 2x^2 + x^4$ 11) _______________

Find the domain of the function.

12) $f(x) = \frac{1}{x - 3} + \frac{4}{x + 7}$ 12) ___________

Find the distance between the pair of points.

13) (-5, -2) and (-17, 3) 13) ___________

Solve the equation by the square root property.

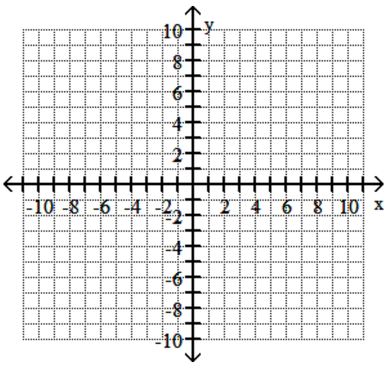
14) $3(x - 6)^2 = 15$ 14) ___________

Solve the problem.

15) A developer wants to enclose a rectangular grassy lot that borders a city street for parking. If the developer has 236 feet of fencing and does not fence the side along the street, what is the largest area that can be enclosed? 15) ___________

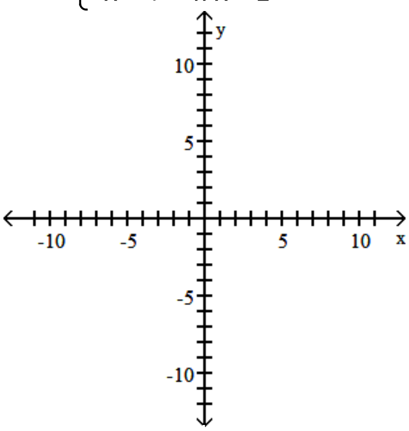
Begin by graphing the standard quadratic function $f(x) = x^2$. Then use transformations of this graph to graph the given function.

16) $h(x) = (x - 2)^2 - 7$ 16) ___________



Graph the function.

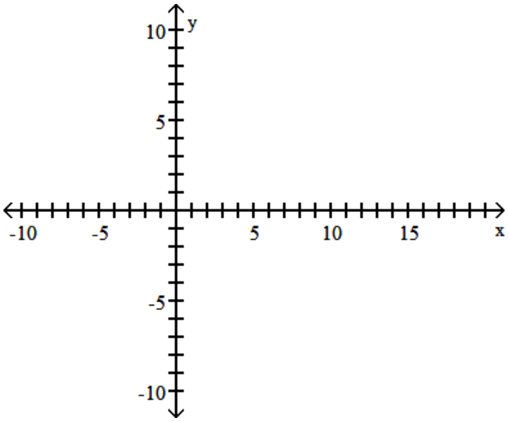
17) $f(x) = \begin{cases} x + 5 & \text{if } -9 \le x < 2 \\ -9 & \text{if } x = 2 \\ -x + 4 & \text{if } x > 2 \end{cases}$ 17) ___________



18)

$$f(x) = \begin{cases} 1 & \text{if } 0 \le x < 5 \\ |x| & \text{if } 5 \le x < 9 \\ \sqrt{x} & \text{if } 9 \le x \le 11 \end{cases}$$

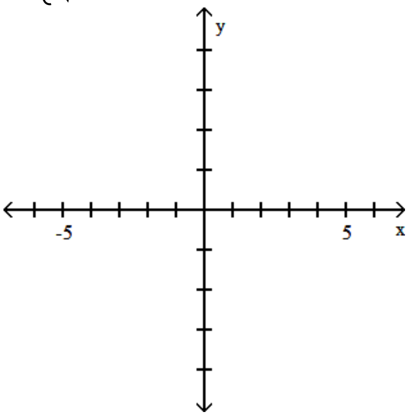
18) ____________



19)

$$f(x) = \begin{cases} -x + 2 & x < 0 \\ \sqrt{x} + 3 & x \ge 0 \end{cases}$$

19) ____________



Find and simplify the difference quotient $\frac{f(x + h) - f(x)}{h}$, $h \neq 0$ for the given function.

20) $f(x) = x^2 + 8x - 9$

20) ____________

21) $f(x) = 3x - 7$

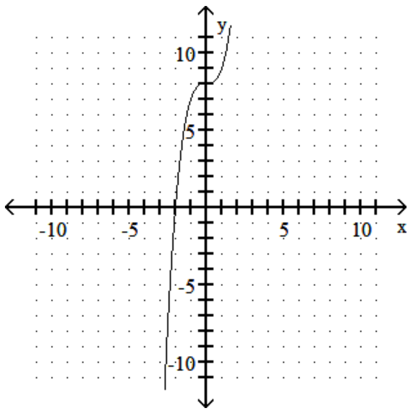
21) ____________

22) $f(x) = \frac{1}{5x}$

22) ____________

Identify the intercepts.

23)



23) ______________

Solve the radical equation, and check all proposed solutions.

24) $\sqrt{2x + 3} - \sqrt{x + 1} = 1$

24) ______________

25) $\sqrt{x + 6} + \sqrt{2 - x} = 4$

25) ______________

Determine ALGEBRAICALLY whether the given function is even, odd, or neither.

26) $f(x) = x^5 - x^4$

26) ______________

27) $f(x) = 2x^2 + x^4$

27) ______________

Find the domain of the composite function $f \circ g$.

28) $f(x) = \dfrac{8}{x + 10}$, $\quad g(x) = \dfrac{20}{x}$

28) ______________

Determine which two functions are inverses of each other.

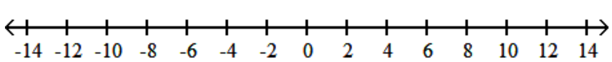
29) $f(x) = 3x \qquad g(x) = \dfrac{x}{3} \qquad h(x) = \dfrac{3}{x}$

29) ______________

Solve the rational inequality and graph the solution set on a real number line. Express the solution set in interval notation.

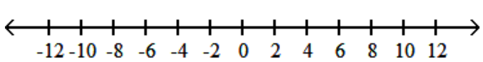
30) $\dfrac{(x + 7)(x - 5)}{x - 1} \geq 0$

30) ______________



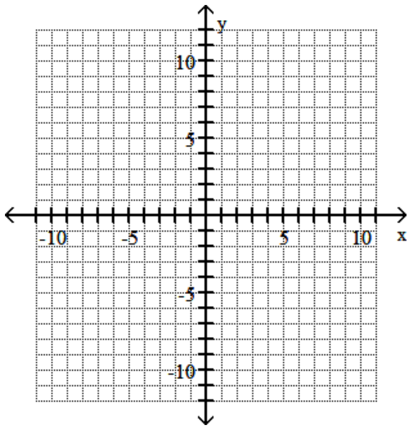
31) $\dfrac{x + 7}{x + 8} < 3$

31) ______________



Use the vertex and intercepts to sketch the graph of the quadratic function.

32) $f(x) = 3 - x^2 - 2x$ 32) ____________

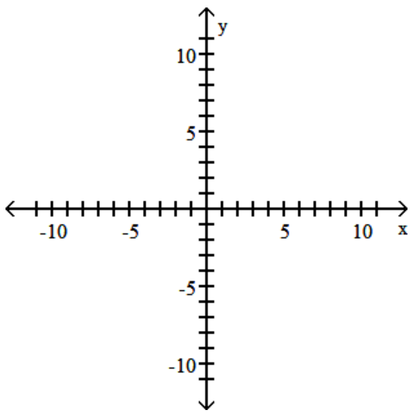


Solve the problem.

33) The cost in millions of dollars for a company to manufacture x thousand automobiles is given by the function $C(x) = 3x^2 - 30x + 200$. Find the number of automobiles that must be produced to minimize the cost. 33) ____________

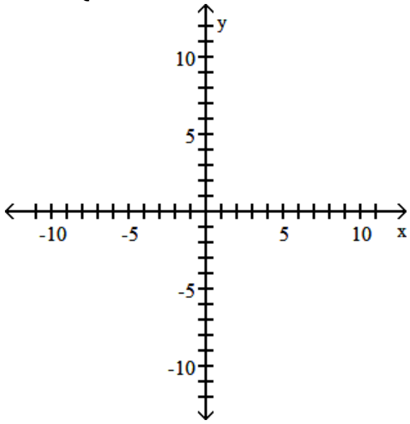
Graph the rational function. SHOW ALL YOUR WORK for the x-int, y-int, vertical asymptote, horizontal or slant asymptote.

34) $f(x) = \dfrac{-4x}{x + 1}$ 34) ____________



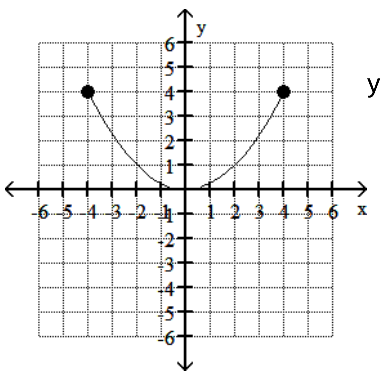
Graph the function.

35) $f(x) = \begin{cases} x + 1 & \text{if } -7 \le x < 4 \\ -6 & \text{if } x = 4 \\ -x + 5 & \text{if } x > 4 \end{cases}$ 35) ____________



Use the graph of the function f, plotted with a solid line, to sketch the graph of the given function g.

36) $g(x) = f(x - 2) + 2$ 36) ____________



y = f(x)

Find the inverse of the one-to-one function.

37) $f(x) = \dfrac{5}{4x + 1}$ 37) ____________

Find the distance between the pair of points.

38) (-2, 2) and (-10, 8) 38) ____________

Write the standard form of the equation of the circle with the given center and radius.

39) (0, -7); $\sqrt{5}$ 39) ____________

Find the center and the radius of the circle.

40) $(x - 1)^2 + (y + 9)^2 = 81$ 40) ____________

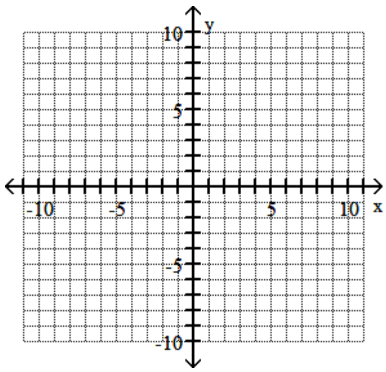
Complete the square and write the equation in standard form. Then give the center and radius of the circle.

41) $x^2 + y^2 - 10x + 8y = -25$ 41) ____________

42) $x^2 + y^2 - 6x - 8y + 12 = 0$ 42) ____________

Graph the equation.

43) $(x - 1)^2 + (y - 5)^2 = 4$ 43) ____________



Solve the problem.

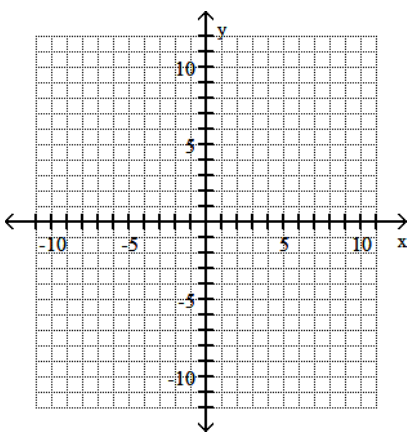
44) A developer wants to enclose a rectangular grassy lot that borders a city street for parking. If the developer has 232 feet of fencing and does not fence the side along the street, what is the largest area that can be enclosed? 44) ____________

45) You have 264 feet of fencing to enclose a rectangular region. What is the maximum area? 45) ____________

46) The cost in millions of dollars for a company to manufacture x thousand automobiles is given by the function $C(x) = 4x^2 - 16x + 36$. Find the number of automobiles that must be produced to minimize the cost. 46) ____________

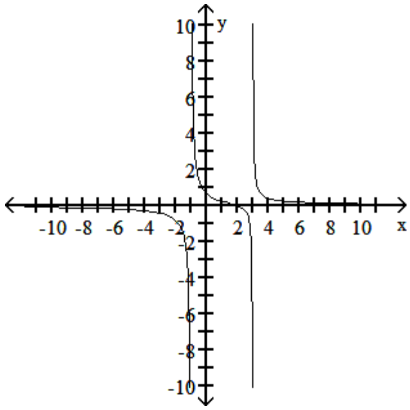
Use the vertex and intercepts to sketch the graph of the quadratic function.

47) $f(x) = 8 - x^2 - 2x$ 47) ____________



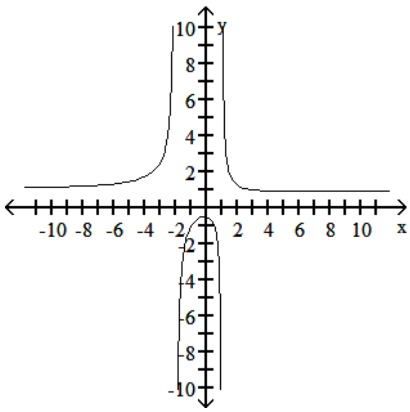
Use the graph of the rational function shown to complete the statement.

48) $\qquad\qquad$ 48) ____________



As $x \to -1^-$, $f(x) \to$?

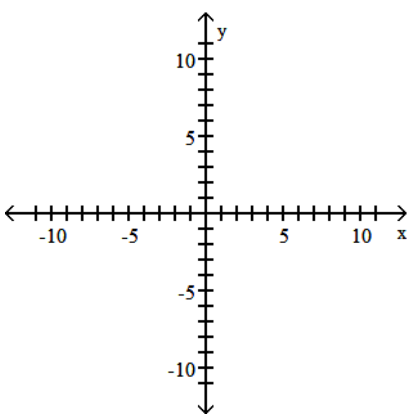
49) $\qquad\qquad$ 49) ____________



As $x \to 1^+$, $f(x) \to$?

Use transformations of $f(x) = \frac{1}{x}$ or $f(x) = \frac{1}{x^2}$ to graph the rational function.

50) $f(x) = \frac{1}{(x + 2)^2} + 3$ $\qquad\qquad$ 50) ____________



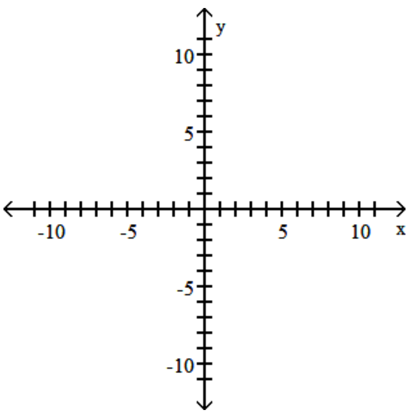
Find the slant asymptote, if any, of the graph of the rational function.

51) $f(x) = \dfrac{x^2 - 4x + 8}{x + 4}$ 51) ______________

52) $f(x) = \dfrac{x^3 + 9}{x^2 - 1}$ 52) ______________

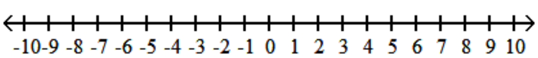
Graph the function.

53) $f(x) = \dfrac{x^2 + 9}{x}$ 53) ______________



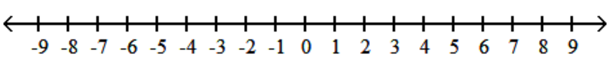
Solve the polynomial inequality and graph the solution set on a number line. Express the solution set in interval notation.

54) $(x - 3)(x - 6) \le 0$ 54) ______________

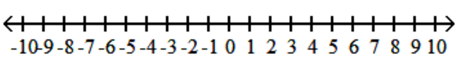


Solve the rational inequality and graph the solution set on a real number line. Express the solution set in interval notation.

55) $\dfrac{x - 6}{x + 8} < 0$ 55) ______________



56) $\dfrac{3}{x - 3} < 1$ 56) ______________

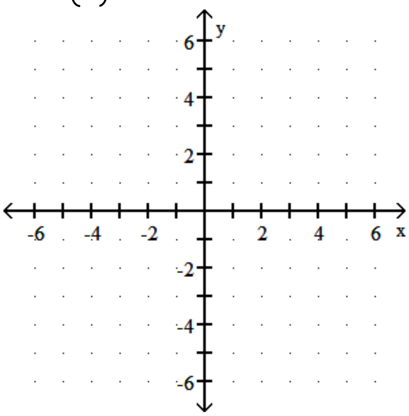


Solve the problem.

57) The function $f(x) = 600(0.5)^{x/70}$ models the amount in pounds of a particular radioactive material stored in a concrete vault, where x is the number of years since the material was put into the vault. Find the amount of radioactive material in the vault after 200 years. Round to the nearest whole number. 57) ______________

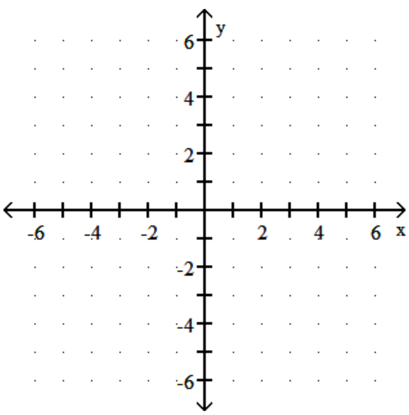
Graph the function by making a table of coordinates.

58) $f(x) = \left(\frac{3}{5}\right)^{x}$ 58) ______________



Graph the function.

59) Use the graph of $f(x) = 4^{x}$ to obtain the graph of $g(x) = 4^{x + 2} - 1$. 59) ______________



Solve the problem.

60) The size of the raccoon population at a national park increases at the rate of 4.2% per year. If the size of the current population is 171, find how many raccoons there should be in 7 years. Use the function $f(x) = 171e^{0.042t}$ and round to the nearest whole number. 60) ______________

Use the compound interest formulas $A = P\left(1 + \frac{r}{n}\right)^{nt}$ and $A = Pe^{rt}$ to solve.

61) Find the accumulated value of an investment of $6000 at 5% compounded annually for 16 years. 61) ______________

62) Suppose that you have $10,000 to invest. Which investment yields the greater return over 8 years: 7.2% compounded monthly or 7.3% compounded quarterly? 62) ______________

Write the equation in its equivalent exponential form.

63) $\log_5 x = 3$ 63) ______________

Write the equation in its equivalent logarithmic form.

64) $5^2 = x$ 64) ______________

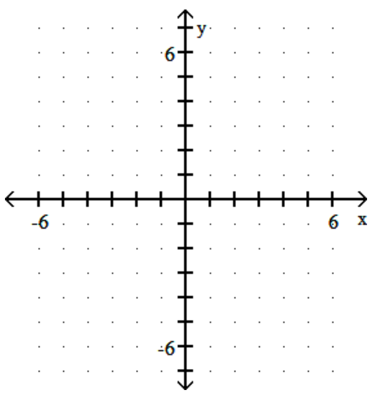
Evaluate the expression without using a calculator.

65) $\log_2 8$ 65) ______________

66) $\log_4 \frac{1}{16}$ 66) ______________

Graph the functions in the same rectangular coordinate system.

67) $f(x) = 5^x$ and $g(x) = \log_5 x$ 67) ______________



Find the domain of the logarithmic function.

68) $f(x) = \log_6 (x + 4)$ 68) ______________

69) $f(x) = \ln (6 - x)$ 69) ______________

70) $f(x) = \log\left(\frac{x + 9}{x - 3}\right)$ 70) ______________

Evaluate or simplify the expression without using a calculator.

71) $10^{\log 6}$ 71) ______________

Use properties of logarithms to expand the logarithmic expression as much as possible. Where possible, evaluate logarithmic expressions without using a calculator.

72) $\log_b (yz^5)$ 72) ______________

73) $\log_6 \left(\frac{7 \cdot 3}{5}\right)$ 73) ______________

74) $\log_5\left(\frac{\sqrt[3]{p}\,\sqrt[4]{q}}{t^2}\right)$ 74) ______________

75) $\log_5\left(\frac{25}{\sqrt{x-1}}\right)$ 75) ______________

76) $\log\left[\frac{3x^3\sqrt[4]{4-x}}{4(x+4)^2}\right]$ 76) ______________

Use properties of logarithms to condense the logarithmic expression. Write the expression as a single logarithm whose coefficient is 1. Where possible, evaluate logarithmic expressions.

77) $\log_c m + \log_c n$ 77) ______________

78) $2\log_y 3 + \log_y 3$ 78) ______________

79) $\frac{1}{6}[3\ln(x+3) - \ln x - \ln(x^2 - 7)]$ 79) ______________

Use common logarithms or natural logarithms and a calculator to evaluate to four decimal places

80) $\log_9 14$ 80) ______________

81) $\log_{29} 330$ 81) ______________

Solve the equation by expressing each side as a power of the same base and then equating exponents.

82) $2^{(5-3x)} = \frac{1}{16}$ 82) ______________

83) $2^{(1+2x)} = 32$ 83) ______________

84) $25^{x+1} = 125^{x-1}$ 84) ______________

Solve the exponential equation. Express the solution set in terms of natural logarithms.

85) $e^{3x} = 5$ 85) ______________

86) $4^{x+6} = 8$ 86) ______________

Solve the exponential equation. Use a calculator to obtain a decimal approximation, correct to two decimal places, for the solution.

87) $3^x = 18$ 87) ______________

Solve the logarithmic equation. Be sure to reject any value that is not in the domain of the original logarithmic expressions. Give the exact answer.

88) $\log_2 x = 5$ 88) ______________

89) $\ln 8 + \ln (x - 1) = 0$ 89) ______

90) $\log (x + 27) - \log 3 = \log (6x + 3)$ 90) ______

91) $\log_2 x + \log_2 (x - 3) = 2$ 91) ______

92) $\log_2 (x + 2) - \log_2 (x - 5) = 3$ 92) ______

93) $\log_3 (x + 6) + \log_3 (x - 6) - \log_3 x = 2$ 93) ______

Solve the problem.

94) Find out how long it takes a \$3400 investment to double if it is invested at 8% compounded quarterly. Round to the nearest tenth of a year. Use the formula $A = P\left(1 + \frac{r}{n}\right)^{nt}$. 94) ______

Determine whether the given ordered pair is a solution of the system.

95) $(-1, -6)$ 95) ______

$x + y = -5$

$x - y = 7$

Solve the system of equations by the substitution method.

96) 96) ______

$2x + 3y = 55$

$x - 4y = 0$

Solve the system by the addition method.

97) $9x + 8y = 36$ 97) ______

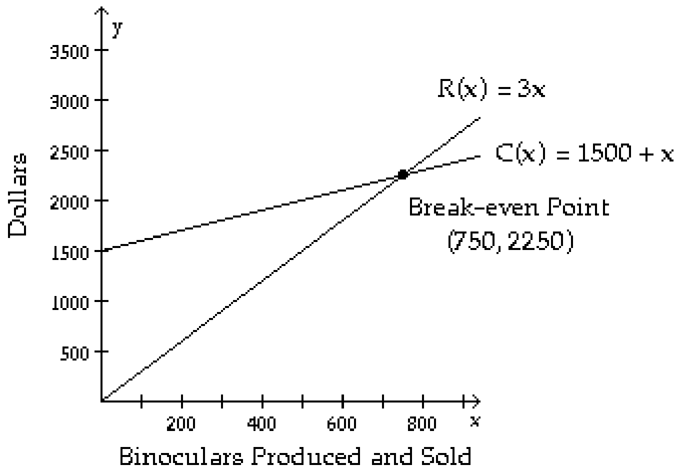
$-3x - 4y = -24$

Solve the system by the method of your choice. Identify systems with no solution and systems with infinitely many solutions, using set notation to express their solution sets.

98) $x - 4y = 1$ 98) ______

$8x - 5y = 62$

The figure shows the graphs of the cost and revenue functions for a company that manufactures and sells binoculars. Use the information in the figure to answer the question.



99) How many binoculars must be produced and sold for the company to break even? 99) ____________

Solve the problem.

100) One number is 12 less than a second number. Twice the second number is 39 more than 3 times the first. Find the two numbers. 100) ____________

101) The Family Fine Arts Center charges \$20 per adult and \$11 per senior citizen for its performances. On a recent weekend evening when 505 people paid admission, the total receipts were \$7058. How many who paid were senior citizens? 101) ____________

Solve the system by the substitution method.

102) $x - 2y = 3$
$x^2 - xy = 20$ 102) ____________

Solve the system by the addition method.

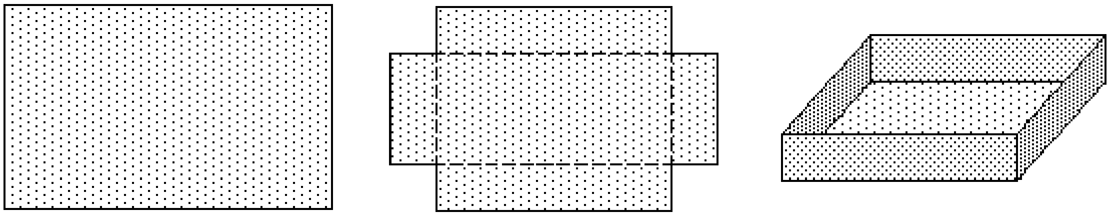
103) $y^2 + 3x^2 = 37$
$y^2 - x^2 = 1$ 103) ____________

Let x represent one number and let y represent the other number. Use the given conditions to write a system of nonlinear equations. Solve the system and find the numbers.

104) The sum of two numbers is 7 and their product is -198. Find the numbers. 104) ____________

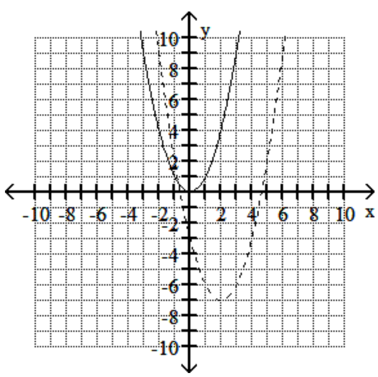
Solve the problem.

105) The area of a rectangular piece of cardboard shown is 512 square inches. The cardboard is used to make an open box by cutting a 2-inch square from each corner and turning up the sides. If the box is to have a volume of 672 cubic inches, find the dimensions of the cardboard that must be used. 105) ____________

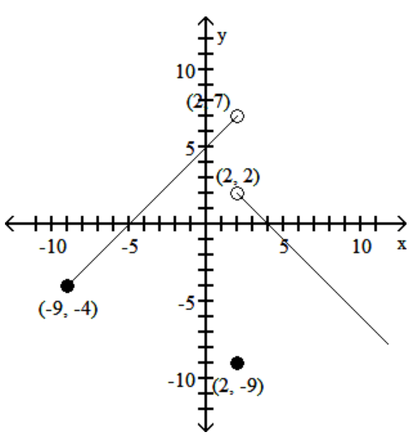


106) A right triangle has an area of 3 square inches. The square of the hypotenuse is 13. Find the lengths of the legs of the triangle. Round your answer to the nearest inch. 106) ____________

1) $-42 - 24i$
2) $\left\{-\frac{1}{8}, 6\right\}$
3) $\left\{-\frac{1}{8}, 7\right\}$
4) $\left\{-\frac{5}{2}, -\frac{4}{3}\right\}$
5) $\left\{\frac{7 \pm i\sqrt{15}}{32}\right\}$
6) $\{-6 - \sqrt{14}, -6 + \sqrt{14}\}$
7) $(16 - \sqrt{21}) + (4\sqrt{7} + 4\sqrt{3})i$
8) $\left\{\frac{-6 - \sqrt{6}}{5}, \frac{-6 + \sqrt{6}}{5}\right\}$
9) $\left\{-\frac{2}{5}, -\frac{3}{5}\right\}$
10) 12 in. by 12 in.
11) Even
12) $(-\infty, -7) \cup (-7, 3) \cup (3, \infty)$
13) 13
14) $\{6 \pm \sqrt{5}\}$
15) 6962 ft^2
16)



17)



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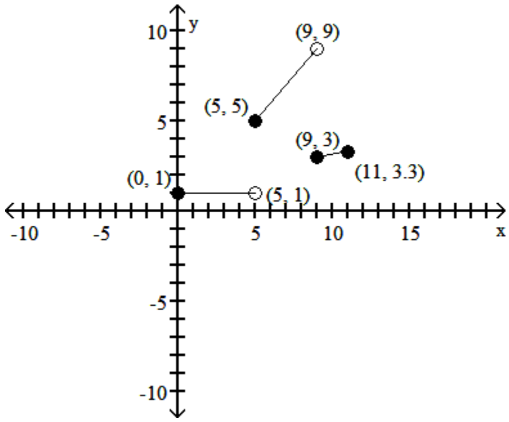

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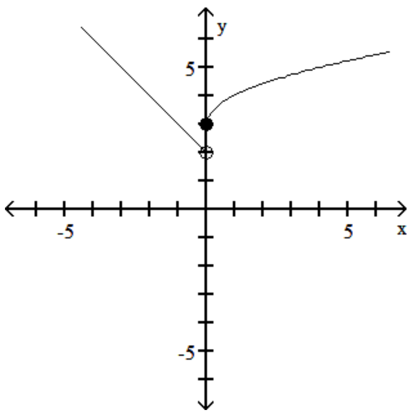


20) 2x + h + 8

21) 3

22) $\dfrac{-1}{5x\,(x + h)}$

23) (-2, 0), (0, 8)

24) {-1, 3}

25) {-2}

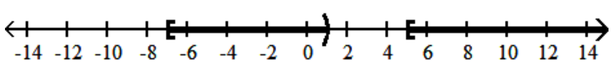
26) Neither

27) Even

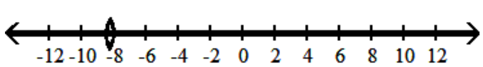
28) $(-\infty, -2)$ or $(-2, 0)$ or $(0, \infty)$

29) f(x) and g(x)

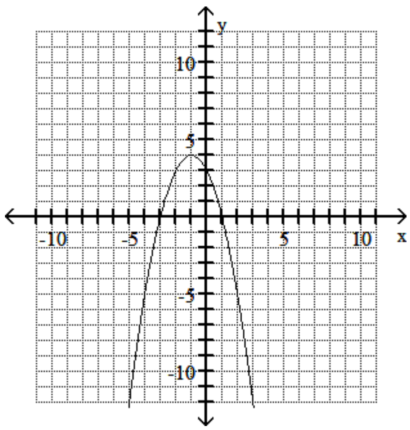
30) $[-7, 1) \cup [5, \infty)$



31) $(-\infty, -8)$ or $\left(-\dfrac{17}{2}, \infty\right)$

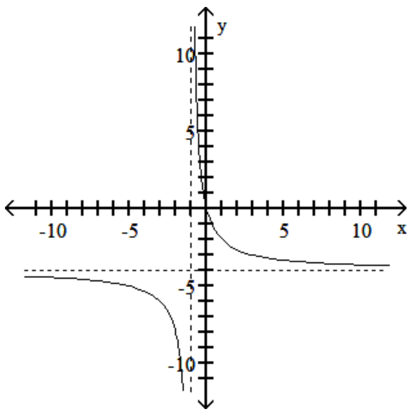


32)

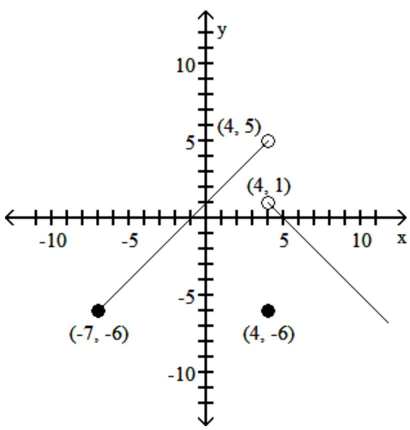


33) 5 thousand automobiles

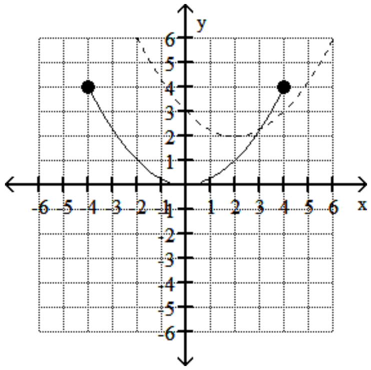
34)



35)



36)



37) $f^{-1}(x) = \frac{5}{4x} - \frac{1}{4}$

38) 10

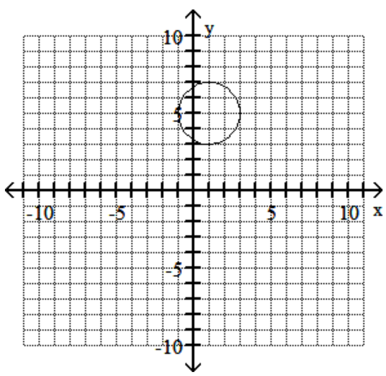
39) $x^2 + (y + 7)^2 = 5$

40) (1, -9), r = 9

41) $(x - 5)^2 + (y + 4)^2 = 16$
(5, -4), r = 4

42) $(x - 3)^2 + (y - 4)^2 = 13$
(3, 4), r = $\sqrt{13}$

43)



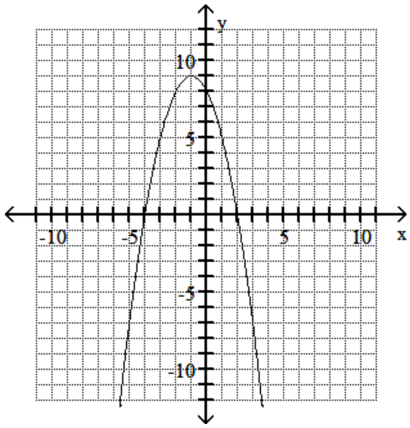
Domain = (-1, 3), Range = (3, 7)

44) 6728 ft^2

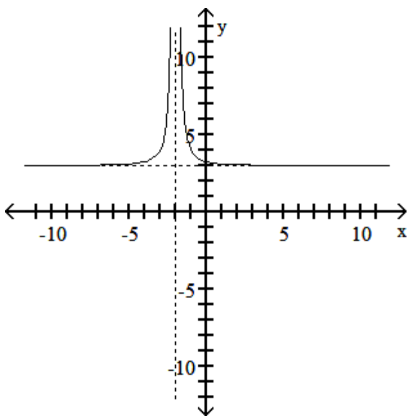
45) 4356 square feet

46) 2 thousand automobiles

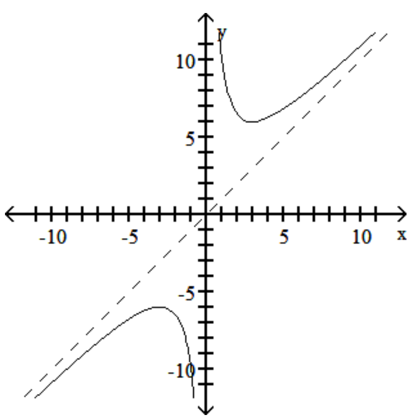
47)



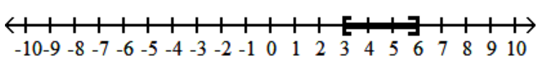
48) -∞
49) +∞
50)



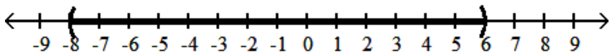
51) y = x - 8
52) y = x
53)



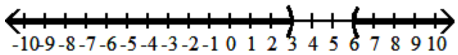
54) [3, 6]



55) (-8, 6)

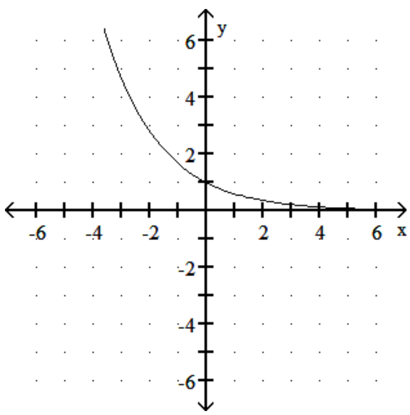


56) $(-\infty, 3)$ or $(6, \infty)$

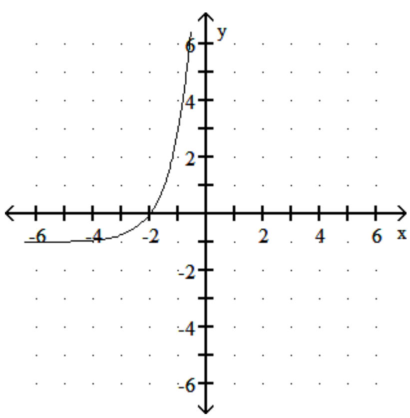


57) 83 pounds

58)



59)



60) 229

61) $13,097.25

62) $10,000 invested at 7.3% compounded quarterly over 8 years yields the greater return.

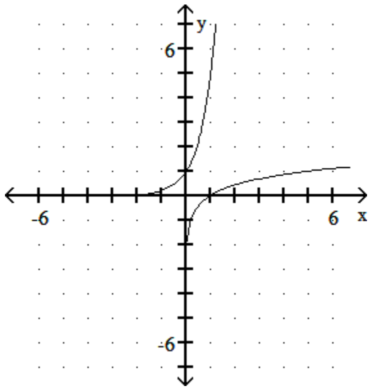
63) $5^3 = x$

64) $\log_5 x = 2$

65) 3

66) -2

67)



68) $(-4, \infty)$

69) $(-\infty, 6)$

70) $(-\infty, -9) \cup (3, \infty)$

71) 6

72) $\log_b y + 5 \log_b z$

73) $\log_6 7 + \log_6 3 - \log_6 5$

74) $\frac{1}{3}\log_5 p + \frac{1}{4}\log_5 q - 2\log_5 t$

75) $2 - \frac{1}{2}\log_5(x - 1)$

76) $\log 3 + 3\log x + \frac{1}{4}\log(4 - x) - \log 4 - 2\log(x + 4)$

77) $\log_c (mn)$

78) $\log_y 27$

79) $\ln \sqrt[6]{\frac{(x + 3)^3}{x(x^2 - 7)}}$

80) 1.2011

81) 1.7222

82) {3}

83) {2}

84) {5}

85) $\left\{\frac{\ln 5}{3}\right\}$

86) $\left\{\frac{\ln 8}{\ln 4} - 6\right\}$

87) 2.63

88) {32}

89) $\{\frac{9}{8}\}$

90) $\left\{\frac{18}{17}\right\}$

91) {4}

92) {6}

93) {12}

94) 8.8 years
95) not a solution
96) {(20, 5)}
97) {(-4, 9)}
98) {(9, 2)}
99) 750 binoculars
100) -15 and -3
101) 338 senior citizens
102) $\{(5, 1), (-8, -\frac{11}{2})\}$
103) $(3, \sqrt{10}), (3, -\sqrt{10}), (-3, \sqrt{10}), (-3, -\sqrt{10})$
104) 18 and -11
105) 16 inches by 32 inches
106) 2 inches and 3 inches