State College of Florida, Manatee-Sarasota
MAC 1105 College Algebra
Final Exam Review

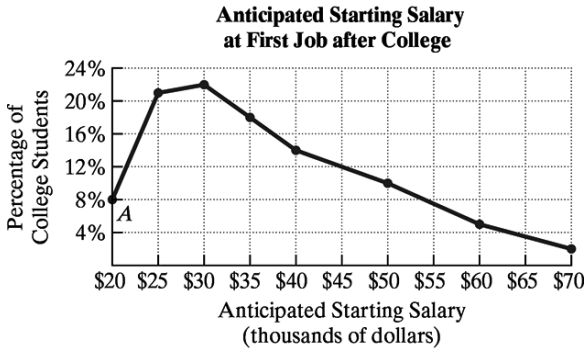
- Make sure you can solve every question without notes or outside help.
- Focus on understanding how to do each type of problem. Not just being able to do the exact problem given.

Questions

1. *In 2010, MonsterCollege surveyed 1250 U.S. college students expecting to graduate in the next several years. Respondents were asked the following question: What do you think your starting salary will be at your first job after college? The line graph shows the percentage of college students who anticipated various starting salaries.*

   (a) What are the coordinates of point A? What does this mean in terms of the information given by the graph?

   (b) What starting salary was anticipated by the greatest percentage of college students? Approximately what percentage of students anticipated this salary?



2. Solve for x over the real numbers.

$$2(x-4)+3(x+5)=2x-2$$

3. Solve for x over the real numbers.

$$7x+5=5(x+3)+2x$$

4. Solve for x over the real numbers.

$$7x+13=2(2x-5)+3x+23$$

5. For the equation

$$\frac{5}{x+3}+\frac{1}{x-2}=\frac{8}{x^2+x-6}$$

   (a) Write the restrictions for the value of x.

   (b) Solve for x over the real numbers.

6. You are choosing between two internet service providers. The first has a one-time installation and activation fee of \$150 and a monthly charge of \$60. The other offers the same services with a one-time fee of \$30 and a monthly charge of \$75.
   (a) After how many months will the total costs for the two providers be the same?
   (b) If you plan to keep the internet service for a year, which provider should you choose?

7. An apartment complex has offered you a move-in special of 30% off the first month's rent. You pay \$945 for the first month with the 30% discount.
   (a) Write an expression that represents the discount amount.
   (b) Write an equation that can be used to find the full price of the rent.
   (c) What is the full price of the rent?

8. You invested \$9000 in two funds paying 1.7% and 1.9% annual interest. At the end of the year, the total interest from these investments was \$166. How much was invested at each rate?

9. The length of a rectangular field is 6 yards less than triple the width. If the perimeter of the field is 340 yards, what are its dimensions?

10. Solve the formula for g.
$$vt + gt^2 = s$$

11. Solve the formula for P.
$$T = \frac{A - P}{Pr}$$

12. Perform the indicated operation. Then simplify and write answer in standard form.
$$(8 - 3i) - (17 - 7i)$$

13. Perform the indicated operation. Then simplify and write answer in standard form.
$$(7 - i)(2 + 3i)$$

14. Perform the indicated operation. Then simplify and write answer in standard form.
$$(3 - 4i)^2$$

15. Perform the indicated operation. Then simplify and write answer in standard form.
$$\frac{3 + 4i}{4 - 2i}$$

16. Perform the indicated operation. Then simplify and write answer in standard form.

$$\sqrt{-32} - \sqrt{-18}$$

17. Perform the indicated operation. Then simplify and write answer in standard form.

$$(-2 + \sqrt{-100})^2$$

18. Solve for x over the complex numbers.

$$2x^2 + 15x = 8$$

19. Solve for x over the complex numbers.

$$2x^2 - 3 = 125$$

20. Solve for x over the complex numbers.

$$5x^2 = -20x$$

21. Solve for x over the complex numbers by completing the square. (Must use this method to receive credit.)

$$x^2 - 2x - 4 = 0$$

22. Solve for x over the complex numbers by using the quadratic formula. (Must use this method to receive credit.)

$$x^2 - 2x = -19$$

23. An architect is allowed 15 square yards of floor space to add a small bedroom to a house. Because of the room's design in relationship to the existing structure, the width of the rectangular floor must be 7 yards less than two times the length. Find the length and width of the rectangular floor that the architect is permitted.

24. For the equation

$$2x^4 = 50x^2$$

    (a) State the type of equation.

    (b) Solve for x over the complex numbers.

25. For the equation

$$\sqrt{2x - 3} + x = 3$$

    (a) State the type of equation.

    (b) Solve for x over the complex numbers.

26. For the equation
$$(x-7)^{2/3} - 25 = 0$$
(a) State the type of equation.
(b) Solve for x over the complex numbers.

27. For the equation
$$x^{\frac{1}{2}} + 3x^{\frac{1}{4}} - 10 = 0$$
(a) State the type of equation.
(b) Solve for x over the complex numbers.

28. For the equation
$$2\,|2x+1| - 14 = 0$$
(a) State the type of equation.
(b) Solve for x over the real numbers.

29. Solve the inequality. Graph the solution on a number line and then write the solution set in interval notation.
$$6x + 5 > -2(x-3) - 25$$

30. Solve the inequality. Graph the solution set on a number line and then write the solution set in interval notation.
$$|2x+3| - 15 \leq 15$$

31. Solve the inequality. Graph the solution set on a number line and then write the solution set in interval notation.
$$\frac{1}{3}\,|2x+6| > 2$$

32. *For each planet in our solar system, its year is the time it takes the planet to revolve once around the Sun. The formula*
$$E = 0.2x^{\frac{3}{2}}$$
models the number of Earth days in a planet's year, E, where x is the average distance of the planet from the Sun, in millions of kilometers.
We have 365 Earth days in our year. What is the average distance of Earth from the Sun?

33. Determine whether each equation defines y as a function of x.
(a) $3x^2 + y = 14$
(b) $2x + y^2 = 6$

34. For $f(x) = 3x^2 - 5x + 2$ evaluate each of the following.
(a) $f(-2)$
(b) $f(x-1)$
(c) $f(-x)$

35. For

$$f(x) = \begin{cases} \sqrt{x-4} & \text{if } x \geq 4 \\ 4 - x & \text{if } x < 4 \end{cases}$$

evaluate each of the following.

(a) $f(13)$

(b) $f(0)$

(c) $f(-3)$

36. Use the given graph of $f(x)$ to determine the following.

(a) State the domain of $f(x)$ using interval notation.

(b) State the range of $f(x)$ using interval notation.

(c) State the intervals on which $f(x)$ is increasing using interval notation.

(d) State the intervals on which $f(x)$ is decreasing using interval notation.

(e) State the x-intercepts. Write as an ordered pair.

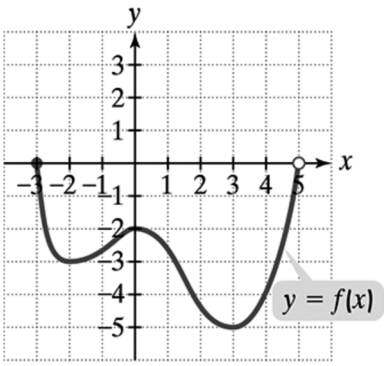
(f) State the y-intercept. Write as an ordered pair.

(g) Find $f(-2)$.

(h) Find $f(3)$.

(i) Find the relative maxima and the numbers at which they occur.

(j) Find the relative minima and the numbers at which they occur.



37. Use the given graph of $f(x)$ to determine the following.

(a) State the domain of $f(x)$ using interval notation.

(b) State the range of $f(x)$ using interval notation.

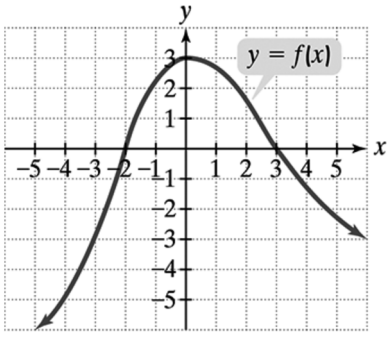
(c) State the intervals on which $f(x)$ is increasing using interval notation.

(d) State the intervals on which $f(x)$ is decreasing using interval notation.

(e) State the x-intercepts. Write as an ordered pair.

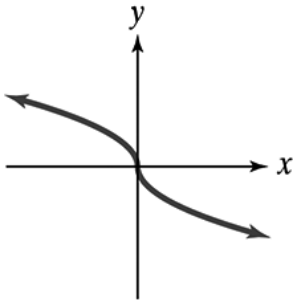
(f) State the y-intercept. Write as an ordered pair.

(g) Find $f(-3)$.



38. Determine whether each function is even, odd, or neither.

(a)



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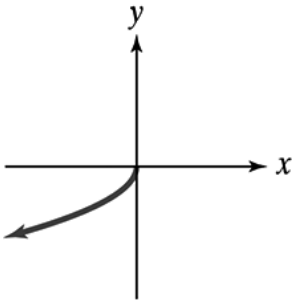
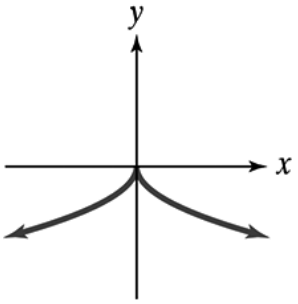


(c)



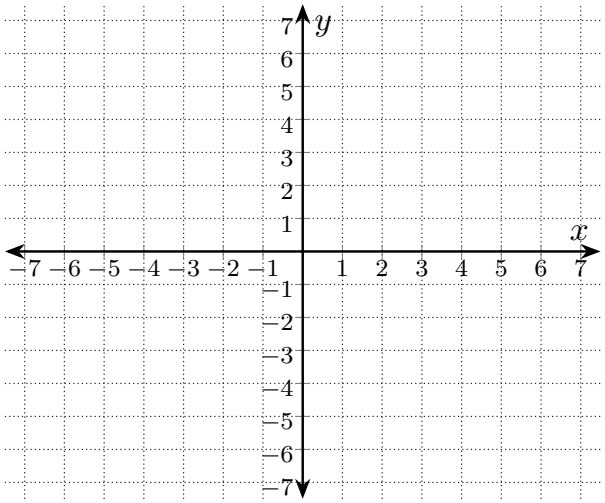
39. Use the algebraic test to determine if each of the following functions are even, odd, or neither.
    (a) $f(x) = x^3 - 5x$
    (b) $g(x) = x^4 - 2x^2 + 1$
    (c) $h(x) = 2x\sqrt{1 - x^2}$

40. Given that $f(x)$ is even and $f(3) = 87$, evaluate $f(-3)$.

41. Complete the given table. Then graph the function.

$$f(x) = \begin{cases} 2x & \text{if } x < 1 \\ -x & \text{if } x \geq 1 \end{cases}$$

x	$f(x)$
-2	
0	
1	
3	



42. Find the simplified difference quotient $\dfrac{f(x+h) - f(x)}{h}$ for the given function.

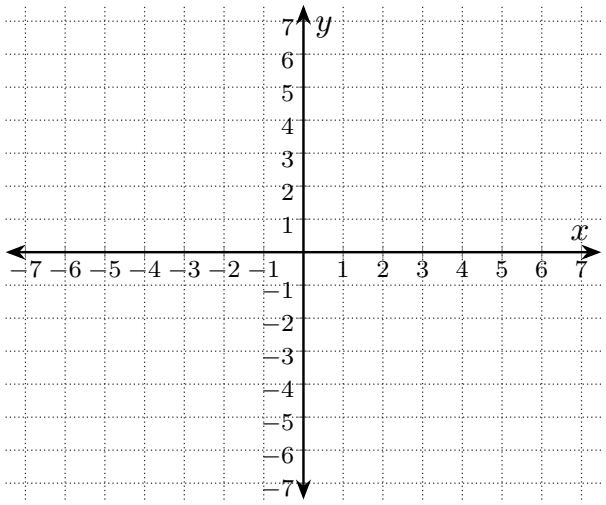
$$f(x) = -2x^2 + x + 10$$

43. Write the slope-intercept form of the equation of the line that passes through the points $(1, 6)$ and $(-1, 2)$.

44. Write the slope-intercept form of the equation of the line that passes through the point $(4, -7)$ and is parallel to the line $3x + y - 9 = 0$.

45. Write the slope-intercept form of the equation of the line that passes through the point $(4, -7)$ and is perpendicular to the line $y = \frac{1}{3}x + 4$.

46. Find the slope and y-intercept of the line $2x + 3y + 6 = 0$. Then graph the line.



47. Find the x- and y-intercepts of the given function. Write as ordered pairs.

$$f(x) = -4x + 7$$

48. Find the average rate of change of $f(x) = x^2 - 4x$ from $x_1 = 5$ to $x_2 = 9$.

49. The population of a small town is modeled by the function

$$P(t) = 1,200 + 150t - 3t^2$$

where $P(t)$ represents the population after t years since 2020.

(a) Find the average rate of change of the population between the years 2022 and 2026. *Include correct units.*

(b) Interpret the meaning of your result in the context of the problem.

50. The function $f(x) = -0.41x + 45.4$ gives the percentage of young adults, ages 25–34, that own a home where x is the number of years after 2000.

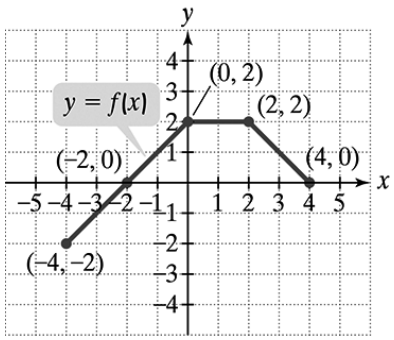
(a) What are the units of the slope?

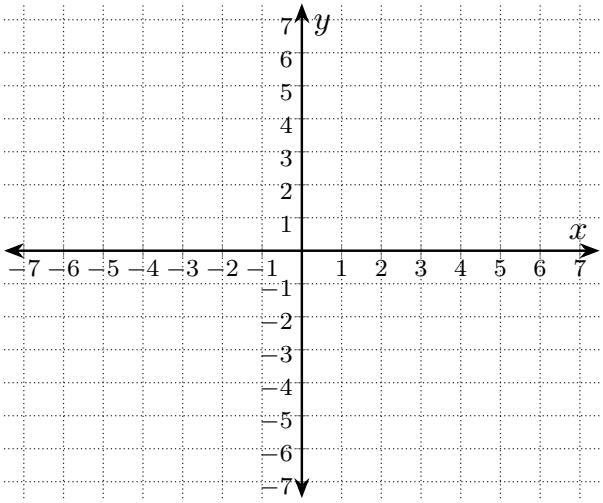
(b) What is the meaning of the slope in this context?

(c) What is the meaning of the y-intercept in this context?

51. Explain in words the transformations needed to obtain $g(x) = \frac{1}{2}f(x - 1)$. *Be sure to specify the correct order.*

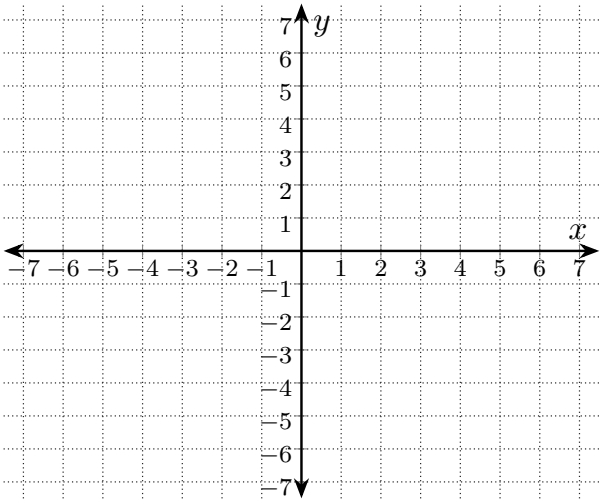
52. Use the given graph of $y = f(x)$ to graph the function $g(x) = 2f\left(\frac{1}{2}x\right)$.





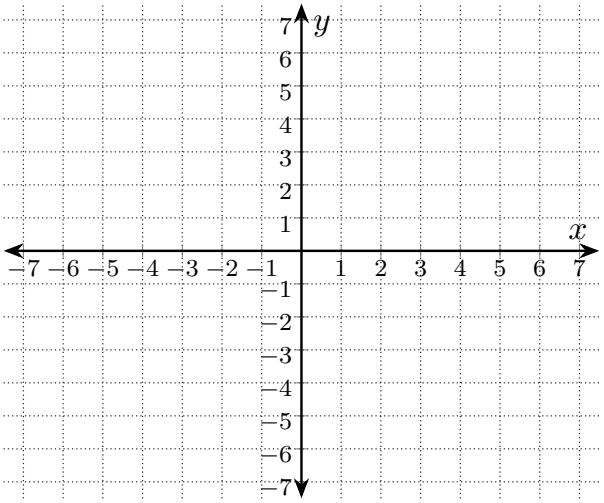
53. Use transformations to graph

$$y(x) = \frac{1}{2}(x-1)^2 + 1$$



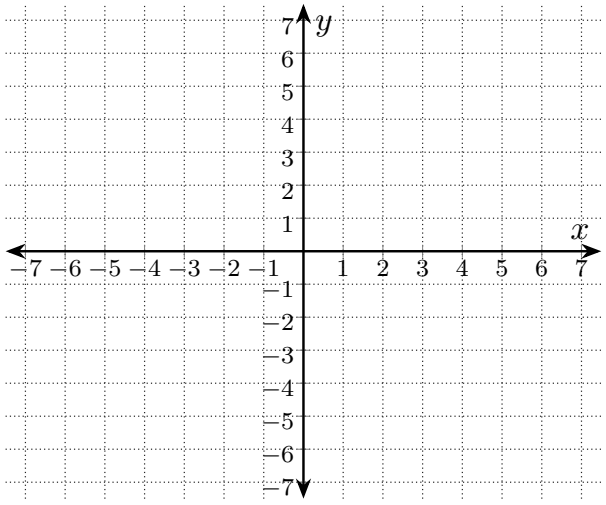
54. Use transformations to graph

$$r(x) = 2\sqrt{x+2}$$

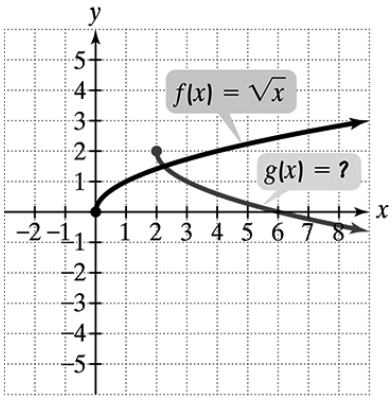


55. Use transformations to graph

$$h(x) = -|x - 1| + 1$$



56. If $g(x)$ is obtained from $f(x)$ through a sequence of transformations, find an equation for g.



57. Find the domain of each function.
    (a) $f(x) = x^2 + 6x - 3$
    (b) $g(x) = \dfrac{4}{x - 7}$
    (c) $h(x) = \sqrt{8 - 2x}$
    (d) $j(x) = \dfrac{x}{x^2 + 4x - 21}$

58. Let $f(x) = \sqrt{x - 2}$ and $g(x) = x - 5$.
    (a) Find $f + g$ and its domain.
    (b) Find $f - g$ and its domain.
    (c) Find fg and its domain.
    (d) Find $\dfrac{f}{g}$ and its domain.
    (e) Find $f \circ g$ and its domain.

59. For $f(x) = \dfrac{x+1}{x-2}$ and $g(x) = \dfrac{1}{x}$ find the following.
    (a) $(f \circ g)(x)$. *Simplify your answer.*
    (b) the domain of $(f \circ g)(x)$. *Write in interval notation.*

60. In each part, express the given function h as a composition of two functions f and g so that $h(x) = (f \circ g)(x)$.
    (a) $h(x) = (x^2 + 2x - 1)^4$
    (b) $h(x) = \sqrt[3]{7x+4}$

61. Use the given graphs of $f(x)$ and $g(x)$ to find the following.

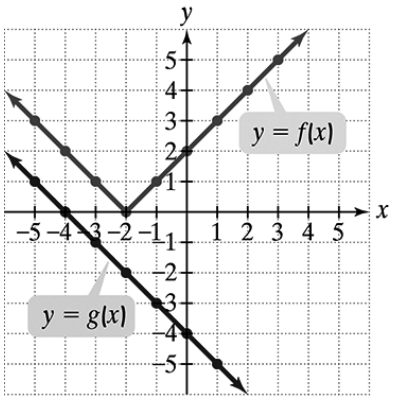
    (a) $(f+g)(-5)$

    (b) $(f-g)(-5)$

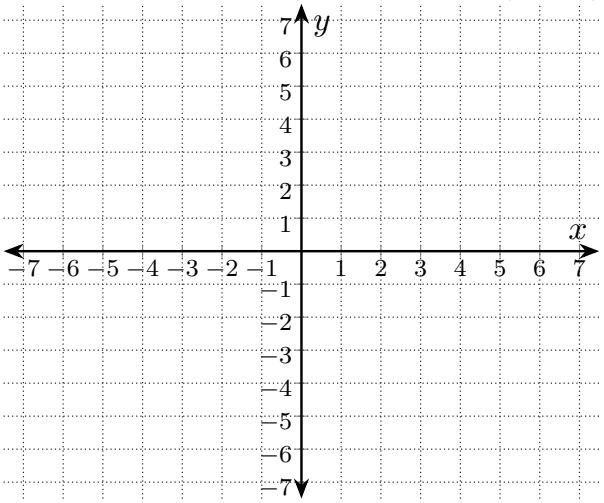
    (c) $(fg)(0)$

    (d) $(f/g)(1)$

    (e) $(f \circ g)(1)$



62. Sketch the graph of f using the following properties. (More than one correct graph is possible.) f is a function that is increasing on $(-\infty, 0)$ and on $(1.2, \infty)$, $f(3) = 0$, and f is decreasing on $(0, 1.2)$.

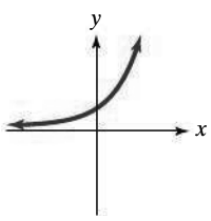


63. Give an example of an odd function.

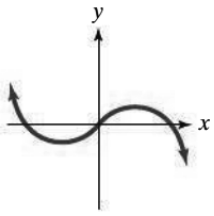
64. For the function $f(x) = \dfrac{5}{x-1}$
    (a) Find $f^{-1}(x)$
    (b) Find the **domain** and **range** of $f(x)$ and the **domain** and **range** of $f^{-1}(x)$.

65. For the function $f(x) = \dfrac{x+4}{x-2}$
    (a) Find $f^{-1}(x)$
    (b) Find the **domain** and **range** of $f(x)$ and the **domain** and **range** of $f^{-1}(x)$.

66. Which of the below functions have inverse functions?



(a)



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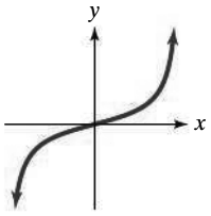
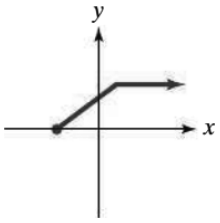
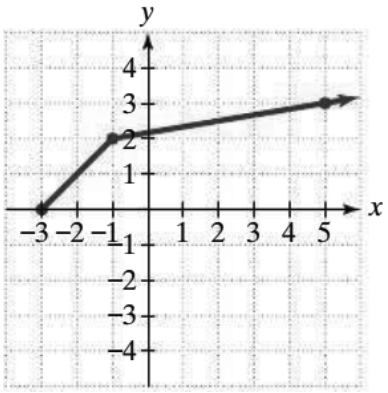


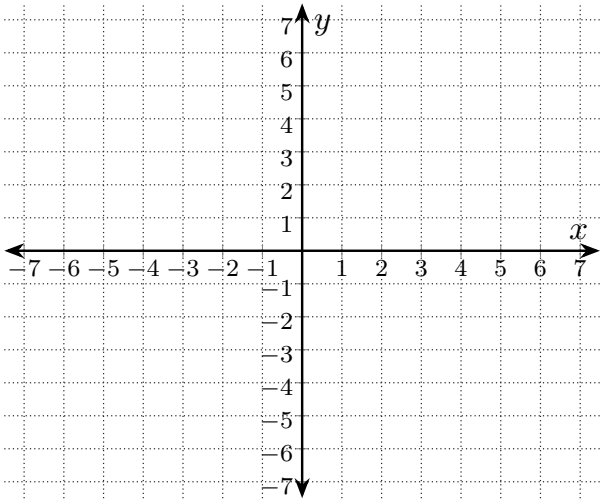
(c)



(d)

67. Use the given graph of $f(x)$ to draw the graph of its inverse function $f^{-1}(x)$.





68. Find the distance between the two points.
$(5, 1)$ and $(8, 5)$

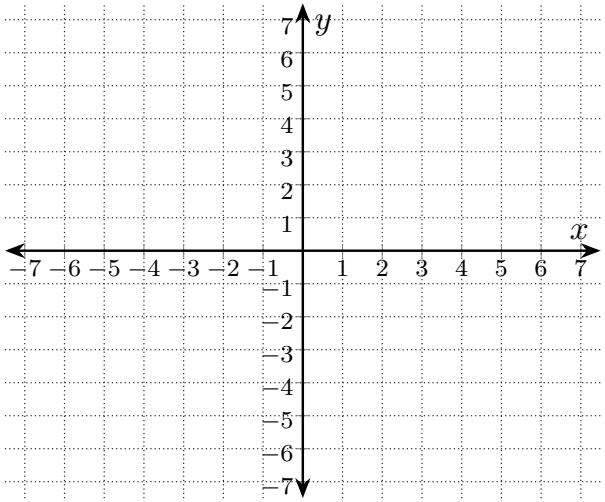
69. Write the standard form of the equation of the circle with the given center and radius.
Center $(-3, 5)$, $r = 3$

70. For the given equation of a circle $x^2 + y^2 + 8x - 2y - 8 = 0$

(a) Complete the square and write the equation in standard form.

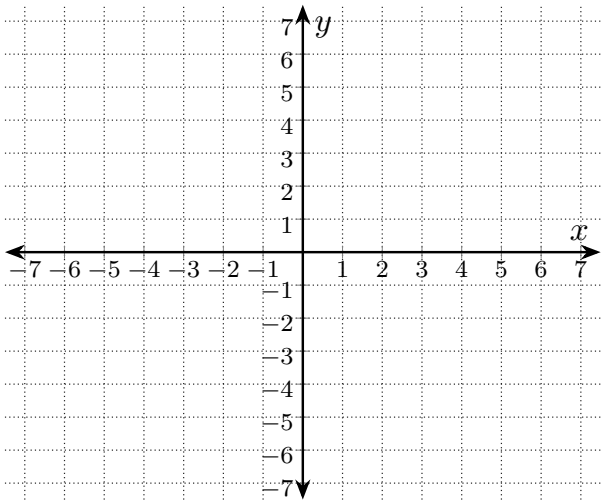
(b) Then give the center and radius of the circle.

71. Find the following for the function $f(x) = -2(x+1)^2 + 5$.
    (a) Vertex. *Write ordered pair.*
    (b) Axis of Symmetry *Write equation.*
    (c) Whether the parabola opens up or down
    (d) Domain *Write in interval notation.*
    (e) Range *Write in interval notation.*
    (f) State whether there is a minimum or a maximum and find the min. or max.
    (g) x-intercept(s) *Write ordered pair(s).*
    (h) y-intercept *Write ordered pair.*
    (i) Graph the function.



Your graph must include the vertex, axis of symmetry, and intercepts.

72. Find the following for the function $f(x) = 2x^2 - 8x + 3$.
    (a) Vertex. *Write ordered pair.*
    (b) Axis of Symmetry *Write equation.*
    (c) Whether the parabola opens up or down
    (d) Domain *Write in interval notation.*
    (e) Range *Write in interval notation.*
    (f) State whether there is a minimum or a maximum and find the min. or max.
    (g) x-intercept(s) *Write ordered pair(s).*
    (h) y-intercept *Write ordered pair.*
    (i) Graph the function.

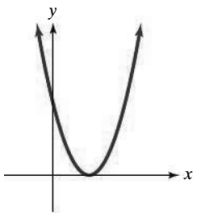


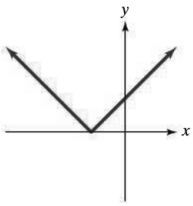
Your graph must include the vertex, axis of symmetry, and intercepts.

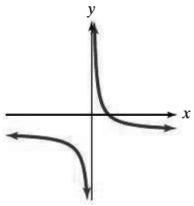
73. A ball is thrown upward and outward. The height of the ball, $f(x)$, in feet, can be modeled by $f(x) = -0.01x^2 + 0.7x + 6.1$ where x is the ball's horizontal distance, in feet, from the point where it was thrown. *For each part, include correct units and round to one decimal place.*
    (a) What is the maximum height of the ball, and how far horizontally from the point where the ball was thrown does the maximum occur?
    (b) What is the distance of the throw, or how far does the shot travel before hitting the ground?
    (c) From what height was the shot released?

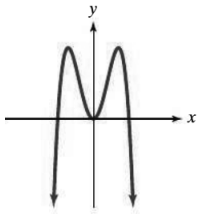
74. Determine whether each function is a polynomial function. For those that are, identify the degree.
    (a) $f(x) = 5x^2 + 6x^3$
    (b) $g(x) = 6x^7 + \pi x^5 + \frac{2}{3}x$
    (c) $h(x) = x^{\frac{1}{3}} - 4x^2 + 7$

75. Which of the below functions are polynomial functions.

(a) 

(b) 

(c) 

(d) 

76. For the function $f(x) = (x+3)(x+1)^3(x+4)$

(a) Determine the graph's end behavior.

(b) Find the x-intercept(s) (if there are any). *Write as ordered pair(s).*

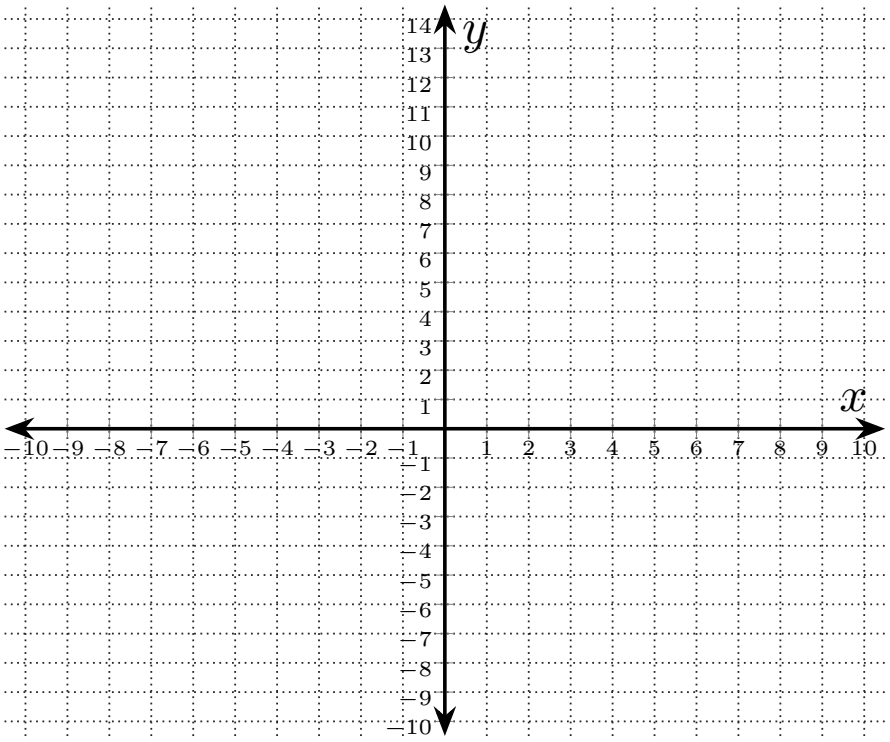
(c) Find the y-intercept (if there is one). *Write as ordered pair.*

(d) Determine the maximum number of turning points.

(e) Graph the function.

Complete the table below to assist with graphing.

x	$f(x)$
-3.5	
-2.5	
-2	
-0.5	



Your graph must include the intercepts.

77. For the function $f(x) = \dfrac{3x}{x-1}$

(a) State the domain of $f(x)$. *Write in interval notation.*

(b) Find the y-intercept (if there is one). *Write as ordered pair.*

(c) Find the x-intercept(s) (if there are any). *Write as ordered pair(s).*

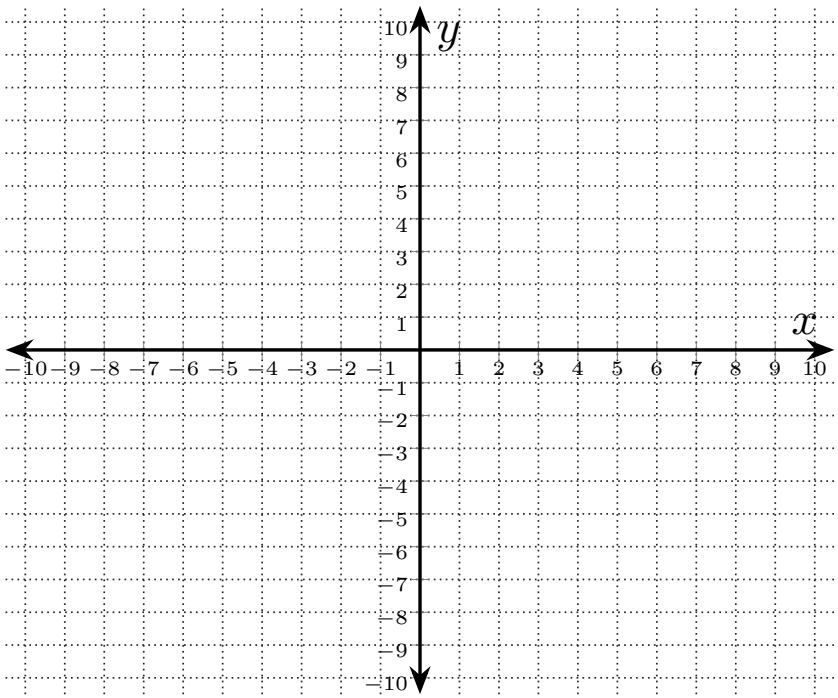
(d) Find any vertical asymptote(s). *Write as equation(s).*

(e) Find the horizontal or oblique asymptote (if there is one). *Write as equation.*

(f) Graph the function.

Complete the table below to assist with graphing.

x	$f(x)$
-2	
-1	
0.5	
2	
3	



Your graph must include the intercepts and asymptotes.

78. For the function $f(x) = \dfrac{x^2 + x - 6}{x - 3}$

(a) State the domain of $f(x)$. *Write in interval notation.*

(b) Find the y-intercept (if there is one). *Write as ordered pair.*

(c) Find the x-intercept(s) (if there are any). *Write as ordered pair(s).*

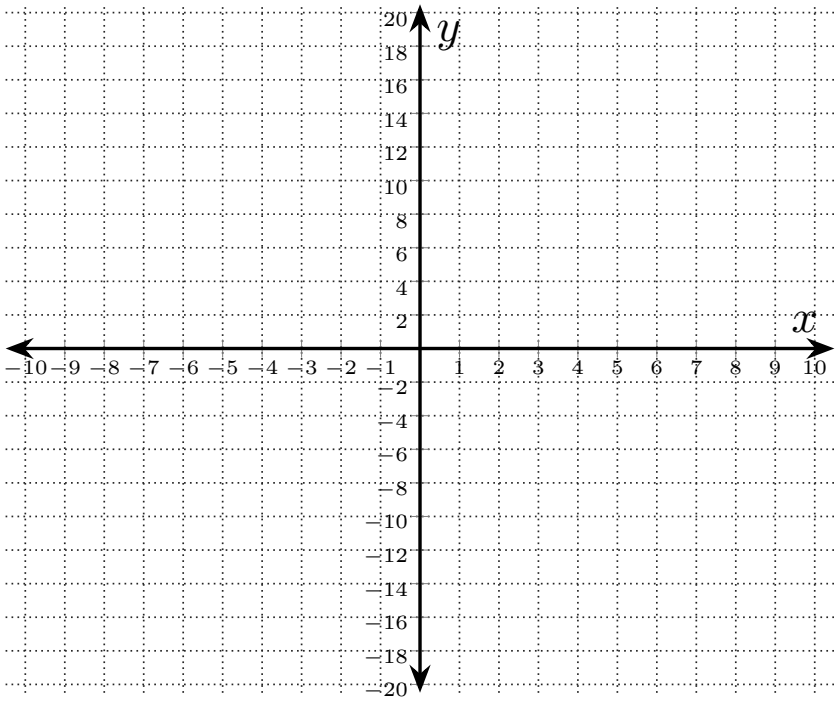
(d) Find any vertical asymptote(s). *Write as equation(s).*

(e) Find the horizontal or oblique asymptote (if there is one). *Write as equation.*

(f) Graph the function.

Complete the table below to assist with graphing.

x	$f(x)$
-6	
-1	
1	
2.5	
5	
7	



Your graph must include the intercepts and asymptotes.

79. Find the horizontal or oblique asymptote (if there is one) of the graph of the given function.

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

80. Find the horizontal or oblique asymptote (if there is one) of the graph of the given function.

$$f(x) = \frac{12x}{3x^2 + 1}$$

81. Find the following for $f(x) = \dfrac{x - 5}{x^2 - 25}$

(a) The domain of the function.

(b) The vertical asymptotes (if there are any) of the graph of the given function.

(c) The x-values (if there are any) where the graph of the function has a hole.

82. Solve the inequality. Graph the solution set on a number line and then write the solution set in interval notation.

$$(x-1)(x-2)(x-3) \geq 0$$

83. Solve the inequality. Graph the solution set on a number line and then write the solution set in interval notation.

$$(x+6)(x-5)^3(x+2) < 0$$

84. Solve the inequality. Graph the solution set on a number line and then write the solution set in interval notation.

$$\frac{x}{x-1} \leq 2$$

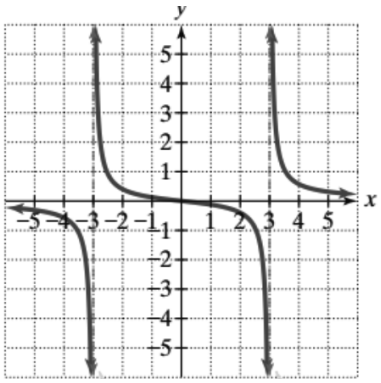
85. Solve the inequality. Graph the solution set on a number line and then write the solution set in interval notation.

$$\frac{x-4}{x+3} > 0$$

86. Evaluate.

$$(f \circ f^{-1})(-7)$$

87. Use the given graph of $f(x)$ to solve the inequality $f(x) \leq 0$.



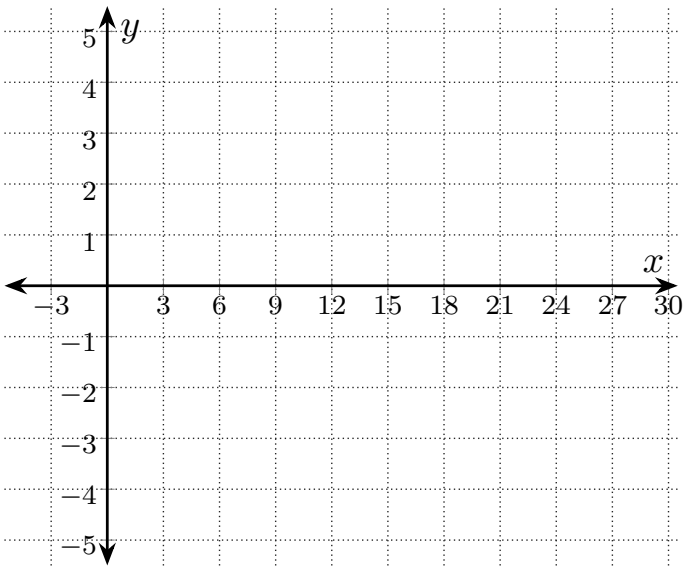
88. Use the change of base theorem to rewrite the following into log. base 10.

$$\log_2(71)$$

89. For the function $f(x) = \log_3(x)$, complete the below x/y-table and write the equation of the asymptote. Then graph the function and its asymptote.

x	$f(x) = \log_3(x)$
1/9	
1/3	
1	
3	
9	
27	

Equation of the asymptote: _____

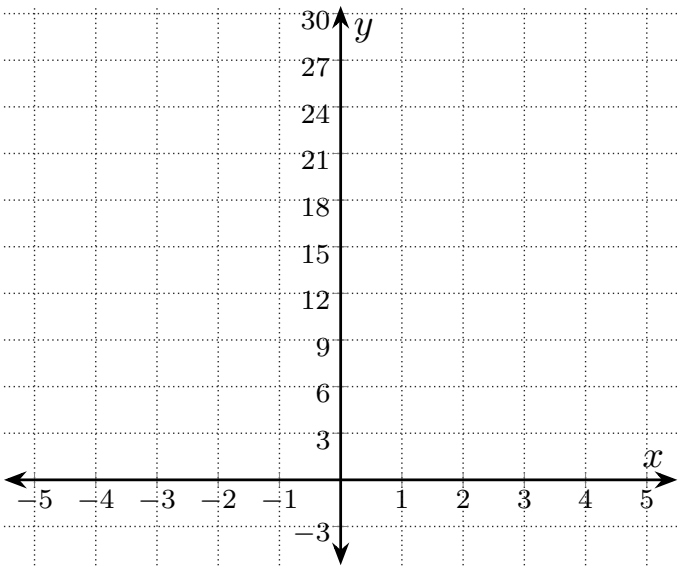


Your graph must include the asymptote.

90. For the function $f(x) = 3^x$, complete the below x/y-table and write the equation of the asymptote. Then graph the function and its asymptote.

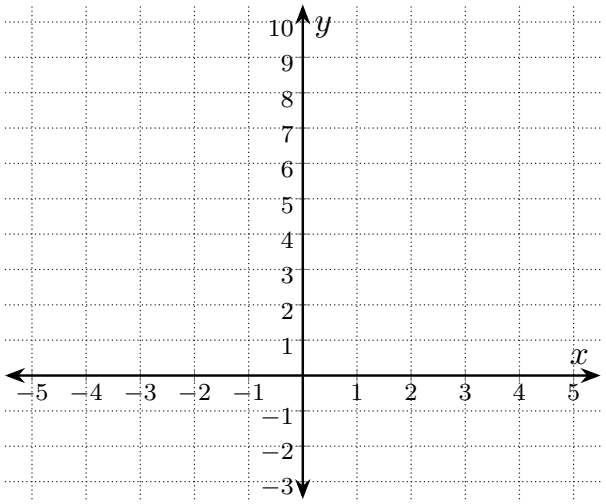
x	$f(x) = \log_3(x)$
−2	
−1	
0	
1	
2	
3	

Equation of the asymptote: _____



Your graph must include the asymptote.

91. Begin by graphing $f(x) = 2^x$.

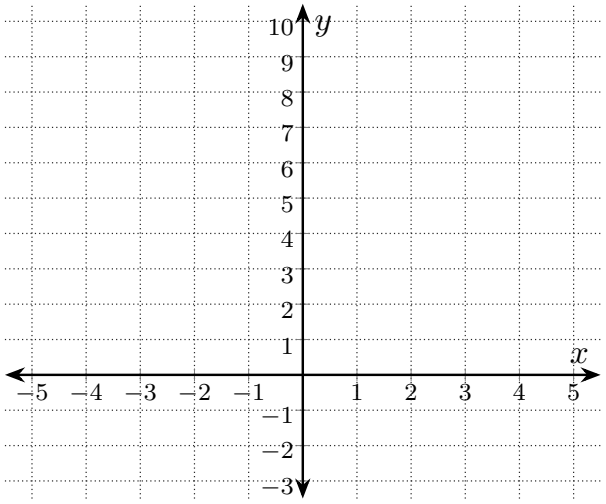


(a) Then use transformations to graph $h(x) = 2^{x+2} - 1$.

(b) State the horizontal asymptote.

(c) State the domain and range of each function.

92. Begin by graphing $f(x) = 2^x$.



(a) Then use transformations to graph $g(x) = 2^{-x}$.

(b) State the horizontal asymptote.

(c) State the domain and range of each function.

93. Use the compound interest formula $A = P\left(1 + \frac{r}{n}\right)^{nt}$ and the continuous interest formula $A = Pe^{rt}$ to solve this question. Suppose that you have \$12,000 to invest. Which investment yields the greater return over 3 years: 0.96% compounded monthly or 0.95% compounded continuously?

94. Convert the equation to its equivalent exponential form.

$$\log_6 216 = y$$

95. Convert the equation to its equivalent exponential form.

$$6 = \log_2 64$$

96. Convert the equation to its equivalent logarithmic form.

$$2^3 = 8$$

97. Convert the equation to its equivalent logarithmic form.

$$\sqrt[3]{8} = 2$$

98. Evaluate the expression without using a calculator.

$$\log_4 16$$

99. Evaluate the expression without using a calculator.

$$\log_5 \frac{1}{5}$$

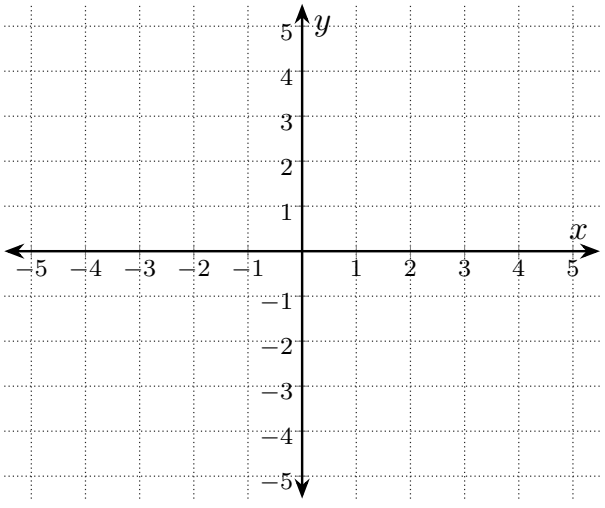
100. Evaluate the expression without using a calculator.

$$8^{\log_8 19}$$

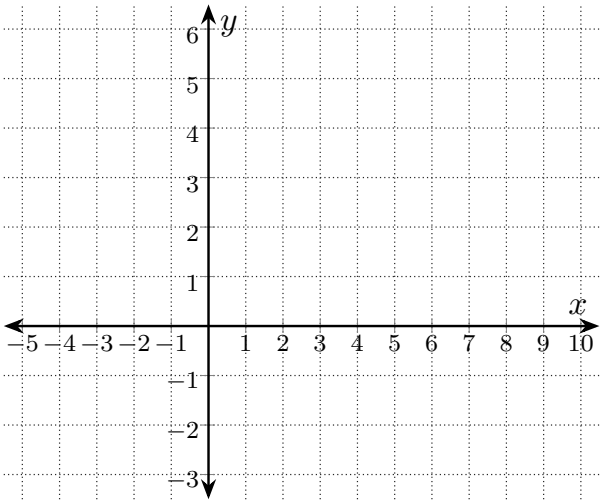
101. Evaluate the expression without using a calculator.

$$\log_6 1$$

102. Graph $f(x) = 4^x$ and $g(x) = \log_4 x$ in the same rectangular coordinate system.



103. Begin by graphing $f(x) = \log_2 x$.



(a) Then use transformations to graph $h(x) = 2 + \log_2 x$.

(b) State the vertical asymptote.

(c) State the domain and range of each function.

104. Find the domain and vertical asymptote of

$$f(x) = \log_5(x + 4)$$

105. Evaluate the expression without using a calculator.

$$\ln e^{9x}$$

106. Evaluate the expression without using a calculator.

$$e^{\ln 300}$$

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

$$\ln\left(\frac{e^2}{5}\right)$$

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

$$\log_6\left(\frac{36}{\sqrt{x+1}}\right)$$

109. Use properties of logarithms to condense the logarithmic expression. Write the expression as a single logarithm whose coefficient is 1.

$$\ln x + \ln 7$$

110. Use properties of logarithms to condense the logarithmic expression. Write the expression as a single logarithm whose coefficient is 1.

$$3\ln x + 5\ln y - 6\ln z$$

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

$$2^x = 64$$

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

$$3^{1-x} = 1/27$$

113. Solve the exponential equation. Provide an exact answer and an approximate answer rounded to 2 decimal places.

$$e^{5x-3} - 2 = 10476$$

114. Solve the exponential equation. Provide an exact answer and an approximate answer rounded to 2 decimal places.

$$7^{x+2} = 410$$

115. Solve the exponential equation. Provide an exact answer and an approximate answer rounded to 2 decimal places.

$$5^{2x+3} = 3^{x-1}$$

116. Solve the logarithmic equation. Be sure to check that your answer is in the domain of the logarithm.

$$\log_3 x = 4$$

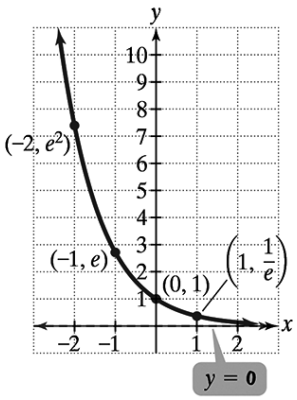
117. Solve the given logarithmic equation over the real numbers. Be sure to reject any value of x that is not in the domain of the original logarithmic expressions.
You must show your algebraic work to receive credit.

$$\log_6(x+5) + \log_6 x = 2$$

118. Solve the given logarithmic equation over the real numbers. Be sure to reject any value of x that is not in the domain of the original logarithmic expressions.
You must show your algebraic work to receive credit.

$$\log(x) + \log(x+3) = 1$$

119. Give the equation of the exponential function that is graphed below.



120. The formula

$$A = 37.3e^{0.0095t}$$

models the population of California, A, in millions, t years after 2010.

(a) Does this model represent exponential growth or exponential decay?

(b) What was the population of California in 2010?

(c) When did the population of California reach 40 million? *To earn credit, you must show your algebraic work.*

121. The logistic growth function

$$f(t) = \frac{100,000}{1 + 4000e^{-t}}$$

describes the number of people, $f(t)$, who have become ill with influenza t weeks after its initial outbreak in a particular community.

(a) Find the y-intercept rounded to nearest person and explain its meaning in this context.

(b) How many people were ill by the end of the third week?

(c) What is the limiting size of the population that becomes ill?

122. Solve the system of equations.

$$\begin{cases} 2x + 5y = 2 \\ -7x - 3y = 22 \end{cases}$$

123. Solve the system of equations.

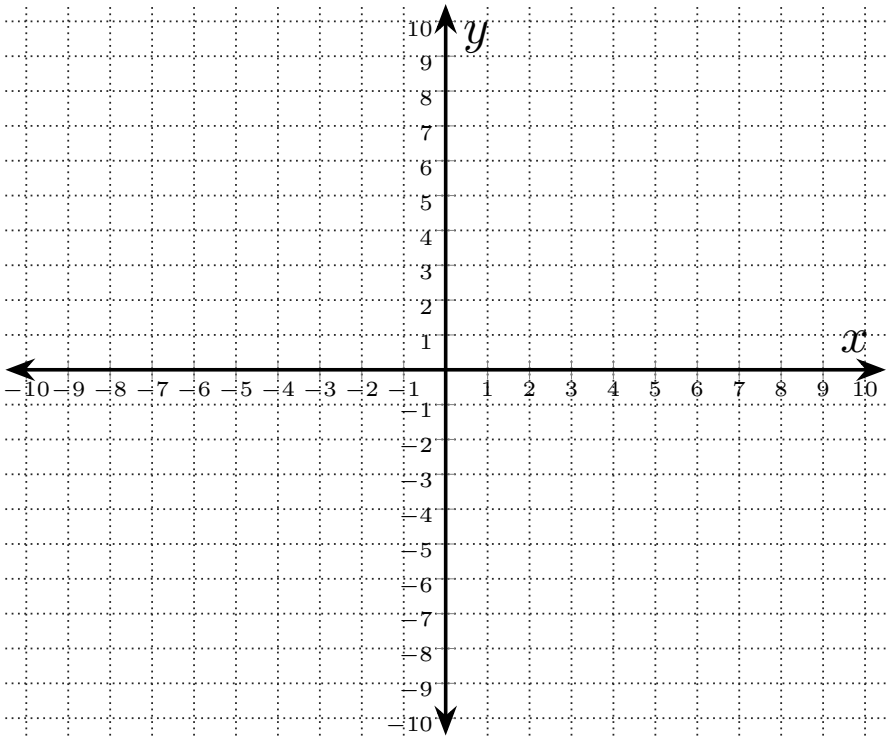
$$\begin{cases} -9x = -y + 5 \\ -3x - 4y = -7 \end{cases}$$

124. The Family Fine Arts Center charges \$20 per adult and \$10 per senior citizen for its performances. On a recent weekend evening when 511 people paid admission, the total receipts were \$7,020. How many who paid were senior citizens?

125. A bank teller has 46 bills in their cash drawer. Some are \$10 bills and the rest are \$20 bills. The value of the bills is \$820. How many \$10 bills are there?

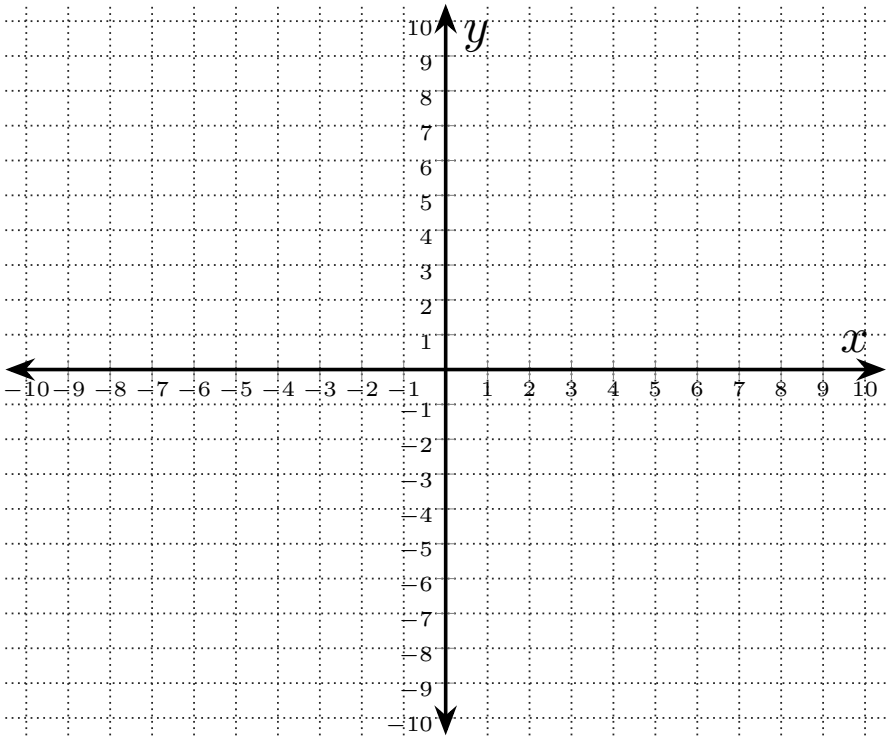
126. Solve the system of inequalities by drawing a graph that represents the solution set.

$$\begin{cases} x^2 + y^2 \leq 81 \\ y > 3^x \end{cases}$$



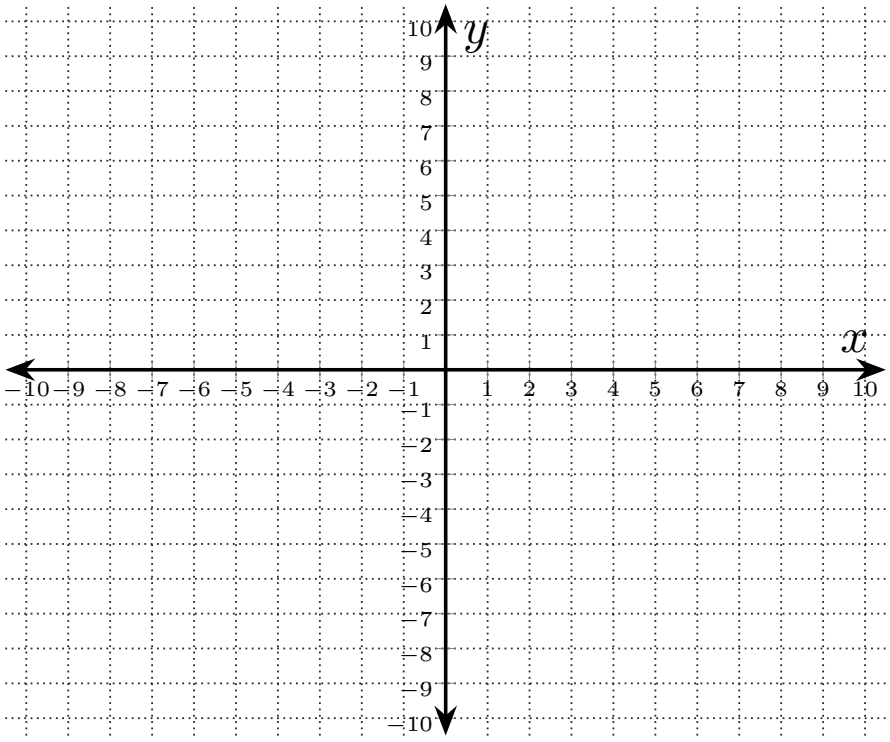
127. Solve the system of inequalities by drawing a graph that represents the solution set.

$$\begin{cases} x^2 + y^2 \leq 4 \\ y - x^2 > 0 \end{cases}$$



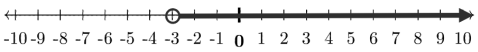
128. Solve the system of inequalities by drawing a graph that represents the solution set.

$$\begin{cases} x + y \leq 7 \\ y \geq 5x - 3 \\ x \geq 0 \\ y \geq 0 \end{cases}$$

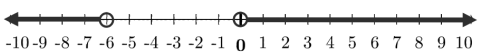


129. A candy company has available 130 lb of cashews and 170 lb of peanuts which they combine into two different mixes. The deluxe mix has half cashews and half peanuts and sells for \$7 per pound. The economy mix has one third cashews and two thirds peanuts and sells for \$5.40 per pound. How many pounds of each mix should be prepared for maximum revenue?

Answer Key

1. a) $(20, 8)$ 8% of students anticipated earning \$20 thousand starting salary
   b) 22% of students anticipated earning \$30 thousand starting salary.
2. $x = -3$
3. No Solutions
4. All Real Numbers
5. a) $x \neq -3, 2$
   b) $x = \frac{5}{2}$
6. a) 8 months
   b) The first one.
7. a) 0.3x
   b) $x - 0.3x = 945$
   c) \$1,350
8. \$2,500 at 1.7% and \$6,500 at 1.9%
9. $w = 44$ yds. and $l = 126$ yds.
10. $g = \frac{s-vt}{t^2}$
11. $P = \frac{A}{1+rT}$
12. $-9 + 4i$
13. $17 + 19i$
14. $-7 - 24i$
15. $\frac{1}{5} + \frac{11}{10}i$
16. $i\sqrt{2}$
17. $-96 - 40i$
18. $x = -8, \frac{1}{2}$
19. $x = -8, 8$
20. $x = -4, 0$
21. $x = 1 \pm \sqrt{5}$
22. $x = 1 \pm 3i\sqrt{2}$
23. $w = 3$ yds. and $l = 5$ yds.
24. a) Polynomial
    b) $x = -5, 0, 5$
25. a) Radical
    $x = 2$
26. a) Rational Exponents
    b) $x = -118, 132$
27. a) Quadratic in Form
    b) $x = 16$
28. a) Absolute value
    b) $x = -4, 3$
29. $(-3, \infty)$ 

30. $[-\frac{33}{2}, \frac{27}{2}]$ 

31. $(-\infty, -6) \bigcup (0, \infty)$ 

32. 149 millon km.
33. a) Yes
    b) No
34. a) 24
    b) $3x^2 - 11x + 10$
    c) $3x^2 + 5x + 2$
35. a) 3
    b) 4
    c) 7
36. a) $[-3, 5)$
    b) $[-5, 0]$
    c) $(-2, 0), (3, 5)$
    d) $(-3, -2), (0, 3)$
    e) $(-3, 0)$
    f) $(0, -2)$
    g) -3
    h) -5
    i) -2 at $x = 0$
    j) -3 at $x = -2$ and -5 at $x = 3$
37. a) $(-\infty, \infty)$
    b) $(-\infty, 3]$
    c) $(-\infty, 0)$
    d) $(0, \infty)$
    e) $(-2, 0)$ and $(3, 0)$
    f) $(0, 3)$
    g) -3

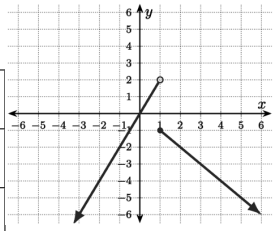
38. a) odd
    b) neither
    c) even

39. a) odd
    b) even
    c) odd

40. 87

41.

x	$f(x)$
-2	-4
0	0
1	-1
3	-3



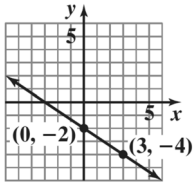
42. $-4x - 2h + 1$

43. $y = 2x + 4$

44. $y = -3x + 5$

45. $y = -3x + 5$

46. $m = -\frac{2}{3}, b = -2$



47. y-int: $(0, 7)$, x-int: $(7/4, 0)$

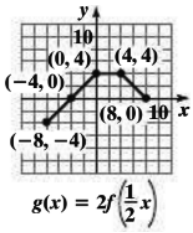
48. 10

49. a) 126 people per year
    b) Between 2022 and 2026, the town's population increased by an average of 126 people per year.

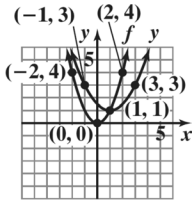
50. a) percent per year
    b) The percentage of young adults who own a home decreased by 0.41% each year.
    c) In 2000, 45.4% of young adults owned a home.

51. 1st. Right 1 (add 1 to x-coordinates)
    2nd. Vertical Shrink (multiply y-coordinates by 1/2)

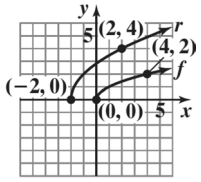
52.



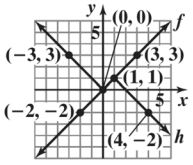
53.



54.



55.



56. $g(x) = -\sqrt{x-2} + 2$

57. a) $(-\infty, \infty)$
    b) $\{x | x \neq 7\}$
    c) $(-\infty, 4]$
    d) $\{x | x \neq -7, 3\}$

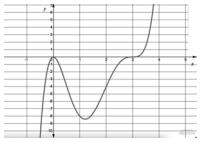
58. a) $(f+g)(x) = \sqrt{x-2} + x - 5$ Domain: $[2, \infty)$
    b) $(f-g)(x) = \sqrt{x-2} - x + 5$ Domain: $[2, \infty)$
    c) $(fg)(x) = \sqrt{x-2}(x-5)$ Domain: $[2, \infty)$
    d) $(\frac{f}{g})(x) = \dfrac{\sqrt{x-2}}{x-5}$ Domain: $[2, 5) \bigcup (5, \infty)$
    e) $(f \circ g)(x) = \sqrt{x-7}$ Domain: $[7, \infty)$

59. a) $(f \circ g)(x) = \dfrac{1+x}{1-2x}$
    b) Domain: $(-\infty, 0) \bigcup (0, \frac{1}{2}) \bigcup (\frac{1}{2}, \infty)$

60. a) $f(x) = x^4, g(x) = x^2 + 2x - 1$
    b) $f(x) = \sqrt[3]{x}, g(x) = 7x + 4$

61. a) 4
    b) 2
    c) -8
    d) $-3/5$
    e) 3

62. Graph



63. $f(x) = x^3$ (*Many possible answers.*)

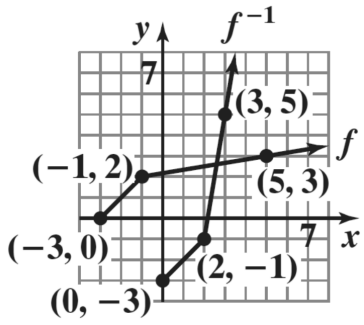
64. (a) $f^{-1}(x) = \frac{5}{x} + 1$

    (b) Domain $f(x)$: $= \{x \mid x \neq 1\}$
    Range $f(x)$: $= \{x \mid x \neq 0\}$
    Domain $f^{-1}(x)$: $= \{x \mid x \neq 0\}$
    Range $f^{-1}(x)$: $= \{x \mid x \neq 1\}$

65. (a) $f^{-1}(x) = \frac{2x+4}{x-1}$

    (b) Domain $f(x)$: $= \{x \mid x \neq 2\}$
    Range $f(x)$: $= \{x \mid x \neq 1\}$
    Domain $f^{-1}(x)$: $= \{x \mid x \neq 1\}$
    Range $f^{-1}(x)$: $= \{x \mid x \neq 2\}$

66. A and C

67. 

68. 5

69. $(x+3)^2 + (y-5)^2 = 9$

70. (a) $(x+4)^2 + (y-1)^2 = 25$

    (b) center $(-4, 1)$ radius 5

71. (a) Vertex $(-1, 5)$

    (b) Axis of Symmetry $x = -1$

    (c) opens down

    (d) Domain $(-\infty, \infty)$

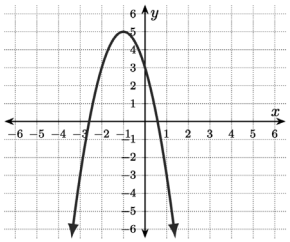
    (e) Range $(-\infty, 5]$

    (f) Maximum of $y = 5$ happens at $x = -1$

    (g) x-intercepts $(-1 \pm \sqrt{\frac{5}{2}}, 0)$

    (h) y-intercept $(0, 3)$

    (i) Graph



72. (a) Vertex $(2, -5)$

    (b) Axis of Symmetry $x = 2$

    (c) opens up

    (d) Domain $(-\infty, \infty)$

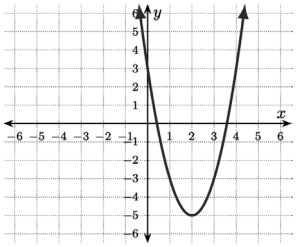
    (e) Range $[-5, \infty)$

    (f) Minimum of $y = -5$ happens at $x = 2$

    (g) x-intercepts $(\frac{4 \pm \sqrt{10}}{2}, 0)$

    (h) y-intercept $(0, 3)$

    (i) Graph



73. (a) Max height = 18.4 ft.,
    Horizontal distance of max. from the throw point=35.0 ft.

    (b) 77.8 ft.

    (c) 6.1 ft.

74. (a) yes, degree 3

    (b) yes, degree 7

    (c) no

75. A and D

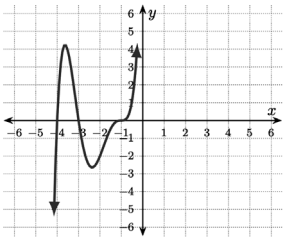
76. (a) end behavior: falls left and rises right.

    (b) $(-4, 0)$ mult = 1 crosses
    $(-3, 0)$ mult = 1 crosses
    $(-1, 0)$ mult = 3 crosses

    (c) y-intercept $(0, 12)$

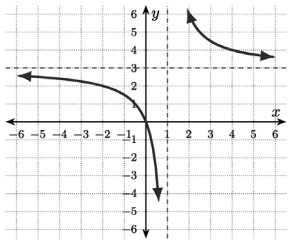
    (d) max of 4 turning points

    (e) Table and Graph



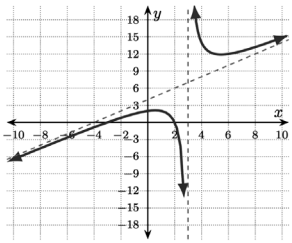
x	$f(x)$
-3.5	≈ 3.9
-2.5	≈ -2.5
-2	-2
-0.5	≈ 1.1

77. (a) $(-\infty, 1) \cup (1, \infty)$
    (b) y-intercept $(0, 0)$
    (c) $(0, 0)$ mult $= 1$ crosses
    (d) $x = 1$ mult $= 1$ switches
    (e) H.A. $y = 3$
    (f) Table and Graph



x	$f(x)$
-2	2
-1	1.5
0.5	-3
2	6
3	4.5

78. (a) $(-\infty, 3) \cup (3, \infty)$
    (b) y-intercept $(0, 2)$
    (c) $(-3, 0)$ mult $= 1$ crosses
    $(2, 0)$ mult $= 1$ crosses
    (d) $x = 3$ mult $= 1$ switches
    (e) O.A. $y = x + 4$
    (f) Table and Graph



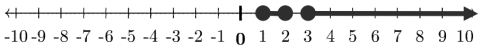
x	$f(x)$
-6	$-8/3$
-1	1.5
1	2
2.5	-5.5
5	12
7	12.5

79. $y = x - 2$

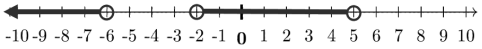
80. $y = 0$

81. (a) Domain $= \{x \mid x \neq \pm 5\}$
    (b) V.A. $x = -5$
    (c) Hole at $x = 5$

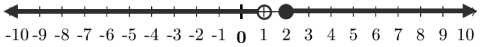
82. $[1, 2] \cup [3, \infty)$



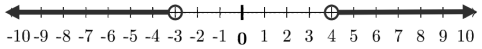
83. $(-\infty, -6) \cup (-2, 5)$



84. $(-\infty, 1) \cup [2, \infty)$



85. $(-\infty, -3) \cup (4, \infty)$



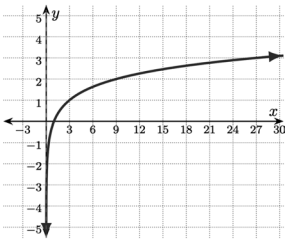
86. -7

87. $(-\infty, -3) \cup [0, 3)$

88. $\dfrac{\log 71}{\log 2}$

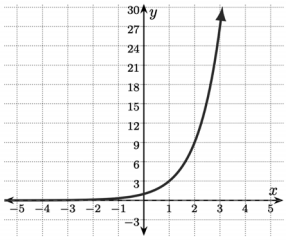
89. Asymptote: $x = 0$

x	$f(x) = \log_3(x)$
1/9	-2
1/3	-1
1	0
3	1
9	2
27	3

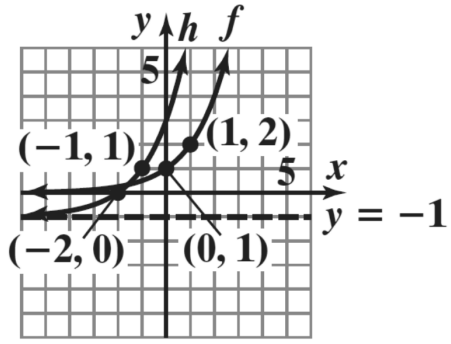


90. Asymptote: $y = 0$

x	$f(x) = \log_3(x)$
-2	1/9
-1	1/3
0	1
1	3
2	9
3	27



91. a) Graph

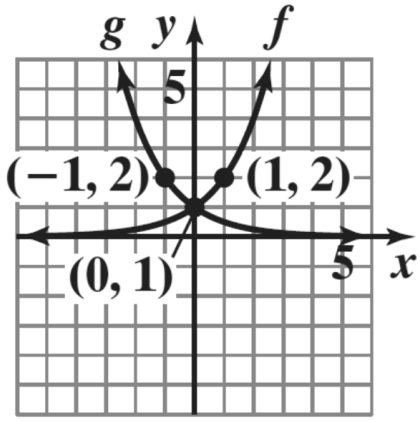


$f(x) = 2^x$

$h(x) = 2^{x+2} - 1$

b) H.A. $y = -1$
c) Domain: $(-\infty, \infty)$, range: $(-1, \infty)$

92. a) Graph



$f(x) = 2^x$

$g(x) = 2^{-x}$

b) H.A. $y = 0$
c) Domain: $(-\infty, \infty)$, range: $(0, \infty)$

93. -0.96% monthly

94. $6^y = 216$

95. $2^6 = 64$

96. $3 = log_2 8$

97. $\frac{1}{3} = \log_8 2$

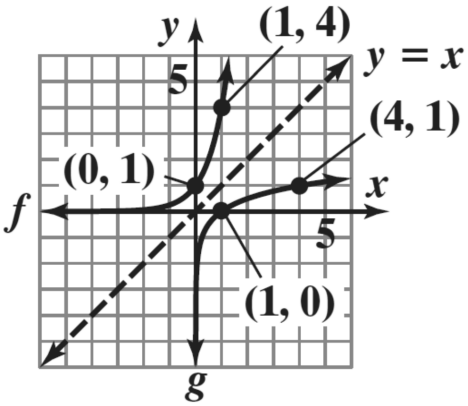
98. 2

99. -1

100. 19

101. 0

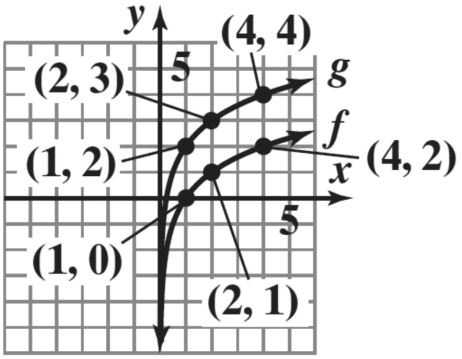
102. Graph



$f(x) = 4^x$

$g(x) = \log_4 x$

103. a) Graph



$f(x) = \log_2 x$

$h(x) = 2 + \log_2 x$

b) V.A. $x = 0$
c) domain: $(0, \infty)$, range: $(-\infty, \infty)$

104. Domain: $(-4, \infty)$ V.A. $x = -4$

105. $9x$

106. 300

107. $2 - \ln 5$

108. $2 - \frac{1}{2}\log_6(x+1)$

109. $\ln 7x$

110. $\ln\left(\frac{x^3y^5}{z^6}\right)$

111. $x = 6$

112. $x = 4$

113. $\frac{\ln 10478+3}{5}$, or Approx 2.45

114. $\frac{\ln 410}{\ln 7} - 2$, or Approx 1.09

115. $\frac{3\ln 5+\ln 3}{\ln 3-2\ln 5}$, or Approx -2.80

116. $x = 81$

117. $x = 4$

118. $x = 2$

119. $y = e^{-x}$

120. (a) growth
    (b) 37.3 million
    (c) 2017

121. (a) y-int $\approx (0, 25)$
    It represents the number of people ill at the time of the initial outbreak.
    (b) 500 people
    (c) 100,000 people

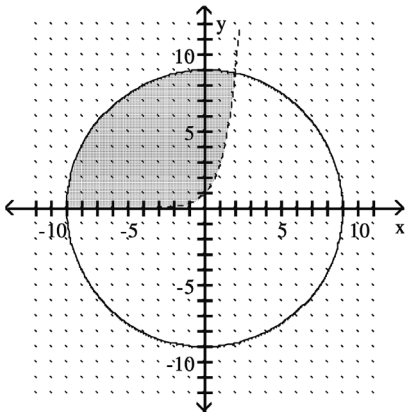
122. $(-4, 2)$

123. $(-\frac{1}{3}, 2)$

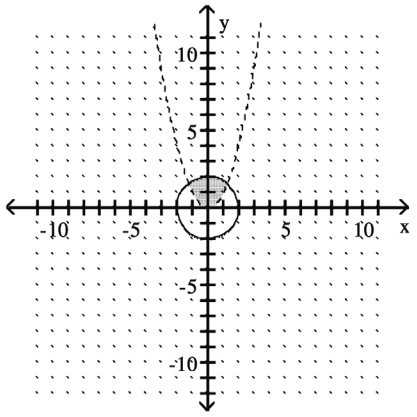
124. 320 senior citizens

125. there are 10 of the \$10 bills

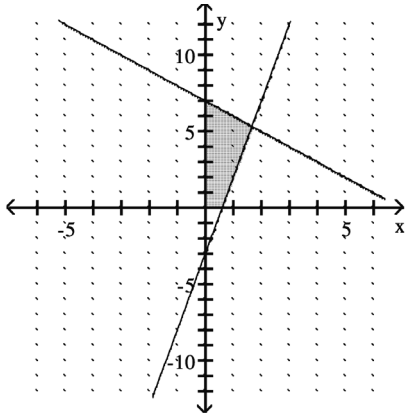
126. Solution set:



127. Solution set:



128. Solution set:



129. 180 lb of deluxe and 120 lb of economy