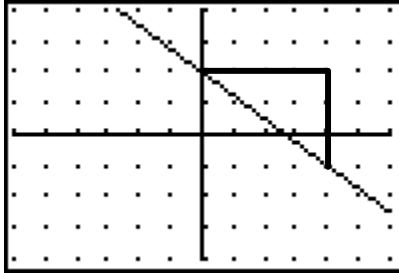
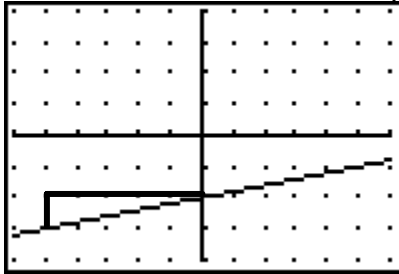


Chapter 2

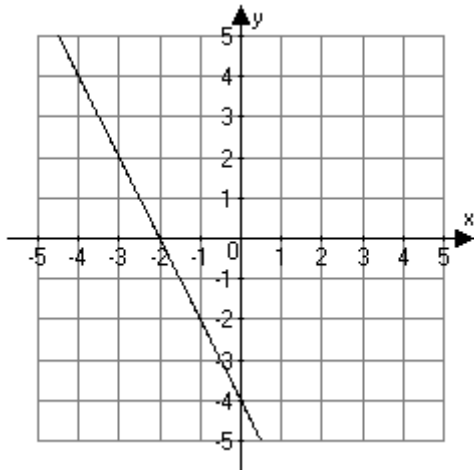
1. Use the graph of the linear function to write the equation for the line in standard form $Ax + By = C$, $A \geq 0$. Each tick mark on the horizontal and vertical axes represents one unit.



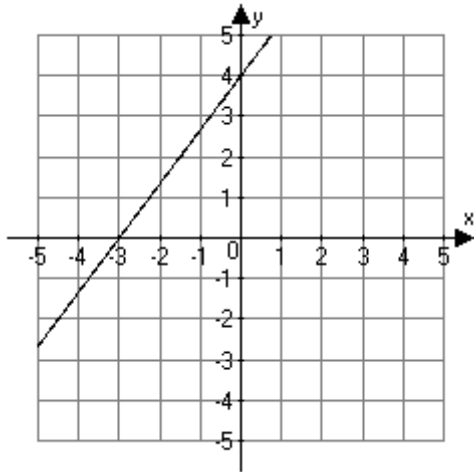
2. Use the graph of the linear function to find the rise, run and slope. Each tick mark on the horizontal and vertical axes represents one unit.



3. Use the graph of the linear function to find the x -intercept, y -intercept and slope.



4. Use the graph of the linear function to find the x -intercept, y -intercept and slope.



5. Which of the equations below define linear functions?

- i) $y = -x^5$
- ii) $y = 2x - 3^3$
- iii) $y = \frac{13}{10}(7x - 4)$
- iv) $y = -\frac{1}{x} - 3$

6. For the equation $21x - 12y = 7$ indicate the slope, the x -intercept, and the y -intercept, if they exist.
7. Write the equation of the line described.
Vertical, goes through $(4, 9)$
8. Write the equation of the line described.
Goes through $(5, -9)$ and $(5, -1)$
9. Write the equation of the line described.
Goes through $(2, 1)$ and $(-9, 1)$

10. Write the slope-intercept form of the equation of the line with the indicated slope and y-intercept.
Slope = 7; y-intercept = -4

11. Write the standard form $Ax + By = C$ of the equation of the line with the indicated slope and y-intercept, where A , B , and C are integers, and $A \geq 0$.
Slope = $\frac{8}{5}$; y-intercept = 5

12. Find an equation for the line that has slope $\frac{11}{10}$ and passes through the point $(-5, -2)$.
Write your answer in slope-intercept form.

13. Find the equation of the line that goes through $(4, -6)$ and $(8, -1)$. Write your answer in slope-intercept form.

14. Find the equation of the line that has x -intercept 9 and y -intercept 2. Write your answer in slope-intercept form.

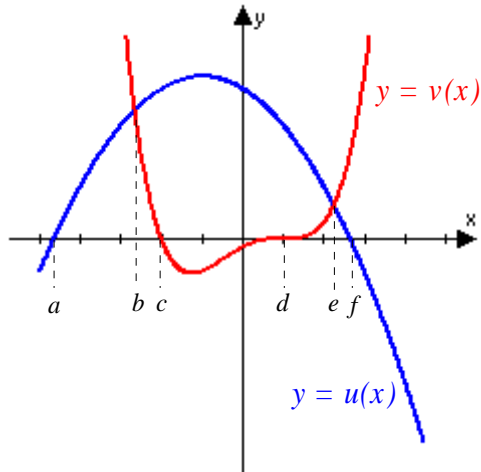
15. Write the equation of the line parallel to the line $3x + 6y = 12$ and passing through the point $(-1, 4)$. Write the final equation in the slope-intercept form $y = mx + b$.

16. Find the linear function f whose graph passes through the points $(4, 8)$ and $(8, -9)$.

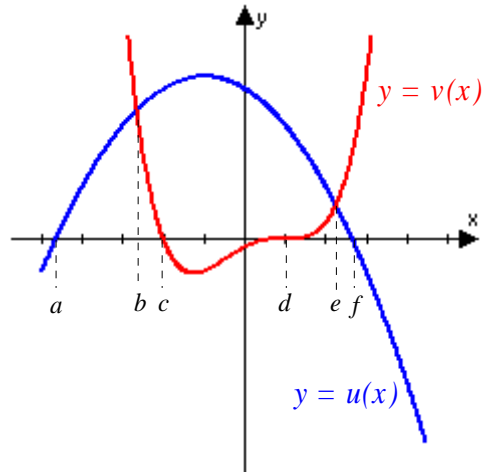
17. The time it takes to do homework includes a fixed amount of time to prepare plus a constant amount of time per problem. If a student can do 5 homework problems in 40 minutes, and 10 problems in 70 minutes, how many minutes will 25 problems take?

18. A puppy weighs 10 ounces at birth and weighs 25 ounces 15 days later. Use a linear model to estimate the weight of the puppy 20 days after its birth.

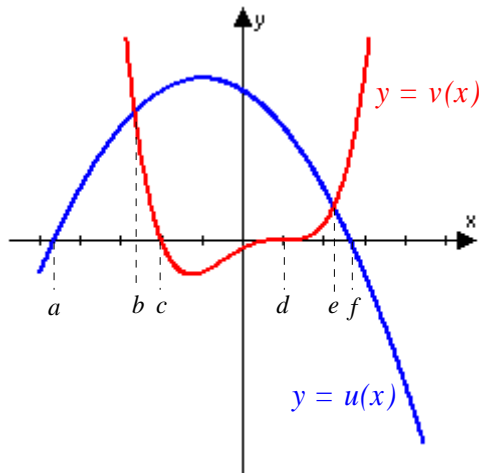
19. Use the graphs of u and v to solve $v(x) = 0$.



20. Use the graphs of u and v to solve $u(x) = v(x)$.



21. Use the graphs of u and v to solve $u(x) - v(x) = 0$.



22. Classify the equation as an identity, conditional equation, or a contradiction.

$$13(x - 8) - 12(x + 2) = x - 128$$

23. Classify the equation as an identity, conditional equation, or a contradiction.

$$7(x - 6) + 4(-8 - x) = 2x - 62$$

24. Classify the equation as an identity, conditional equation, or a contradiction.

$$4(x - 9) - 8(x - 8) = -4x + 21$$

25. Solve. $9x + 6 = 2x - 15$
26. Solve. $4(x - 2) + 6x = 12$
27. Solve. $3(x - 8) + 7x = 8x - 2$
28. Solve. $\frac{x}{3} - \frac{x}{8} = \frac{7}{24}$
29. Solve. $20 + 10(x - 7) = 5(x + 4) + 5x$
30. Solve. $\frac{8}{x + 8} + 3 = \frac{x}{x + 8}$
31. Solve. $\frac{x}{x - 3} - 7 = \frac{3}{x - 3}$
32. Solve. $\frac{5}{y + 4} + \frac{11}{y^2 + y - 12} = \frac{7}{y - 3}$
33. Solve for x :
 $(x + 5)(x - 4) = (x + 3)(x - 7)$
34. Solve for x in
 $7 - \frac{3x - 7}{1} = \frac{x + 3}{7}$
35. Solve for the indicated variable.
 $E = I(R + r)$ for r (internal resistance)

36. Solve for the indicated variable.

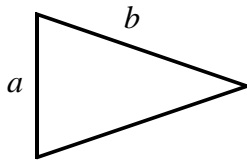
$$\frac{1}{f} = (n-1) \left(\frac{1}{R_1} + \frac{1}{R_2} \right) \text{ for } R_1 \text{ (modified lens formula)}$$

37. Solve for f :

$$\frac{1}{f} = \frac{1}{a} + \frac{1}{b}$$

38. Solve for x . $y = \frac{x+3}{x-7}$

39. Write a mathematical expression for the relation described verbally below.
Side b is ten more than side a .



40. Solve for x : $\frac{x+10+\frac{24}{x}}{1+\frac{4}{x}} = x+6$

41. Find four consecutive even integers so that the sum of the first three is 2 more than twice the fourth.
42. One employee of a pet store is paid a base salary of \$1700 a month plus a 6% commission on all sales over \$6576 during the month. How much must the employee sell in 1 month to earn a total of \$3400 for the month?
43. The cruising speed of an airplane is 160 miles per hour (relative to the ground). You wish to hire the plane for a 4-hour sightseeing trip. You instruct the pilot to fly west as far as he can and still return to the airport in the allotted time. How far west (in miles) should the pilot fly if the wind is blowing from the west at 20 miles per hour?

44. How many gallons of distilled water must be mixed with 75 gallons of 30% alcohol solution to obtain a 25% solution?
45. A fuel distributor has 160,562 gallons of fuel with 0.9% sulfur content, which exceeds pollution control standards of 0.6% sulfur content. How many gallons of fuel oil with a 0.2% sulfur content must be added to the 160,562 gallons to obtain fuel oil that complies with the pollution control standards? Round to the nearest gallon.
46. Find a linear model for the men's 100 meter freestyle data given in the table below. Let x be years since 1958. Do the same for the women's 100 meter freestyle. Do these models indicate that the women will eventually catch up with the men? If so, when?

| Year | Men (seconds) | Women (seconds) |
|------|---------------|-----------------|
| 1968 | 52.20 | 60.00 |
| 1972 | 51.22 | 58.59 |
| 1976 | 49.99 | 55.65 |
| 1980 | 50.40 | 54.79 |
| 1984 | 49.80 | 55.92 |
| 1988 | 48.63 | 54.93 |
| 1992 | 49.02 | 54.65 |
| 1996 | 48.74 | 54.50 |
| 2000 | 48.30 | 53.83 |

47. Assume the table below contains price-supply data and price-demand data for wheat. Find a linear model for the price-supply data giving supply as a function of price. Do the same for price-demand data giving demand as a function of price. Compute the equilibrium price for wheat.

| Price (\$/bu) | Supply (Billion bu) | Price (\$/bu) | Demand (Billion bu) |
|---------------|---------------------|---------------|---------------------|
| 2.05 | 6.28 | 2.05 | 9.77 |
| 2.19 | 7.27 | 2.11 | 9.35 |
| 2.26 | 7.53 | 2.22 | 8.47 |
| 2.48 | 7.92 | 2.33 | 8.12 |
| 2.47 | 8.12 | 2.39 | 7.75 |
| 2.51 | 8.24 | 2.47 | 6.98 |
| 2.71 | 9.23 | 2.59 | 5.57 |

48. Find the vertex and axis of the parabola.
 $f(x) = (x + 4)^2 - 5$

49. Write a brief verbal description of the relationship between the graph of the indicated function and the graph of $y = x^2$.

$$f(x) = -(x - 2)^2 - 4$$

50. Complete the square for the expression.

$$x^2 - 5x$$

51. Complete the square and find the vertex form of the quadratic function.

$$f(x) = 4x^2 + 24x + 29$$

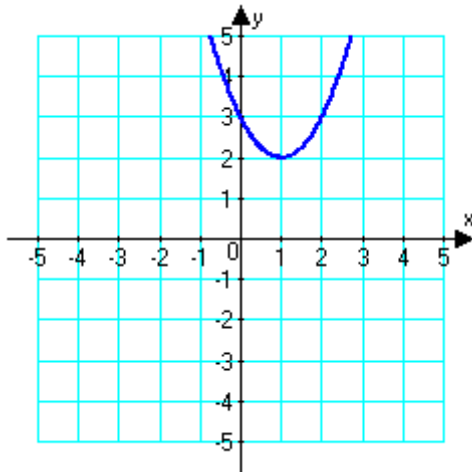
52. Find the intervals where f is increasing and where f is decreasing: $f(x) = -2x^2 - x - 4$

53. What is the minimum value of the function $2x^2 - 8x + 16$?

54. What is the minimum value of the function $2(x - 7)^2 + 7$?

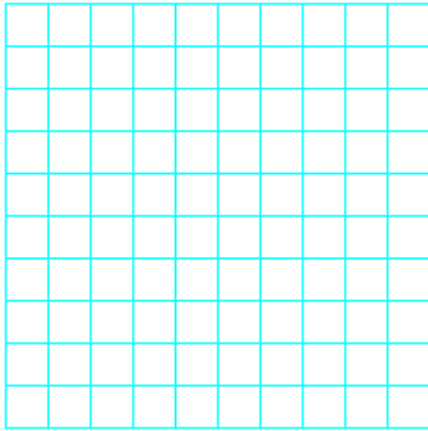
55. Find an equation of a quadratic function whose graph satisfies the given conditions.
Vertex: $(5, 5)$; y -intercept 30

56. Write an equation for the quadratic graphed below.



57. Find the equation of the secant line through the indicated points on the graph of f .
Graph f and the secant line on the same coordinate system.

$$f(x) = 4 - x^2; (-1, 3), (3, -5)$$



58. A hot air balloon at 10,000 feet drops some candy that bounces off another hot air balloon after 2.5 seconds. What is the height of the lower hot air balloon?
59. Classify the number into one or more of the following types: imaginary, pure imaginary, real, complex.
 $-3 + 6i$
60. Perform the indicated operation and write the answer in standard form.
 $(3i)^2$
61. Subtract. Write the result in standard form.
 $(1 - 9i) - (9 - 2i)$
62. Multiply. Write the result in standard form.
 $6i(-10 + 8i)$
63. Multiply. Write the result in standard form.
 $(2 - 6i)(2 + 6i)$
64. Simplify and write the answer in standard form $(8 + 5i)(6 - 3i)$.

65. Divide and write your answer in standard form.

$$\frac{11}{4+3i}$$

66. Simplify and write the answer in standard form
- $\frac{8+5i}{4-2i}$
- .

67. Evaluate and express in standard form:
- $\sqrt{3}\sqrt{-27}$

68. Simplify and put into standard form
- $(-25 - \sqrt{-49}) - (-36 - \sqrt{-25})$
- .

69. Simplify and put into standard form
- $(5 + \sqrt{-11})(3 - \sqrt{-3})$
- .

70. Convert imaginary numbers to standard form, perform the indicated operation, and express the answer in standard form.

$$\frac{2 - \sqrt{-4}}{2}$$

71. Divide and write your answer in standard form.

$$\frac{-1-3i}{i}$$

72. Simplify and put into standard form
- $(3 - 2i)^2 - 3(3 - 2i)$
- .

73. Simplify:
- i^{79}

74. Solve for
- x
- and
- y
- .

$$(3x + 4) + (5y - 1)i = 10 - 16i$$

75. Solve for
- x
- and
- y
- .

$$\frac{(4+x) + (y+3)i}{2-i} = 3+i$$

76. Solve for x and y :

$$\frac{(x+3) + (y-4)i}{2-i} = -4 + i$$

77. Solve. Express your answer in standard form.

$$(3+i)z + 2i = 6i$$

78. Solve for z . Express the answer in standard form.

$$-2iz + (1-5i) = (-1-2i)z + 3-6i$$

79. Simplify and write the answer in standard form $(9u+vi)(u-5vi)$.

80. Perform the indicated operations, and write the answer in standard form. Show all of your work.

$$\frac{c+di}{a-bi}$$

81. Show that $i^{4k+3} = -i$, k a natural number. Show all of your work.

82. Let $S_n = (-i) + (-i)^2 + (-i)^3 + (-i)^4 + \cdots + (-i)^n$, for $n \geq 1$. Come up with a general formula for S_n where you list four cases.

83. Solve by factoring.

$$(x+9)(9x+6) = 0$$

84. Solve by factoring.

$$x^2 + 2x - 63 = 0$$

85. Solve by factoring $x^2 + x = 12$.

86. Solve by completing the square: $t^2 - 8t = 0$.

87. Solve by completing the square.

$$x^2 - 10x + 22 = 0$$

88. Solve using the quadratic formula.

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

89. Use the discriminant to determine the number and type of zeros for

$$0.5x^2 + 2x + 0.75 = 0.$$

90. By considering only the discriminant, characterize the zeros of the following quadratic equation:
- $-2x^2 + 1x = 4.2$

91. Use a graph to determine the number and types of zeros:
- $p^2 + 8.1p + 6.1 = 0$

92. Determine the roots of
- $x^2 - 4x + 200 = 0$
- .

93. Solve.
- $6x^2 + 3x = -$

94. Solve for
- b
- :
- $f = k(Z - b)^2$

95. When the following quadratic is solved
- $x^2 + \sqrt{5}x - 7 = 0$
- and the roots approximated to two decimal places, the result is:

96. Solve.
- $2 - \frac{7}{x} = \frac{7}{x^2}$

97. When the following equation is solved
- $\frac{1}{x+3} - \frac{1}{x-3} = 3$
- and the roots approximated to two decimal places, the result is:

98. Solve and express the solution in standard form:
- $x^2 - 12ix - 32 = 0$

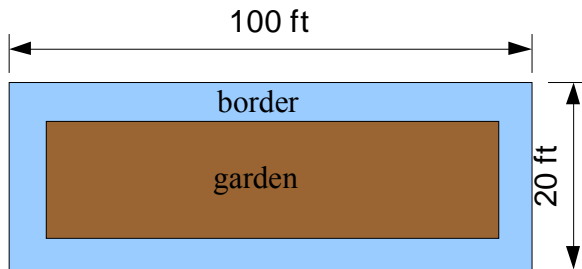
99. Find all solutions.

$$x^4 - 1 = 0$$

100. Are there two consecutive odd numbers such that the difference in their squares is 80?

101. The product of two consecutive positive even integers is 224. Find the integers.

102. A gardener has a garden that is 20 feet wide and 100 feet long. She wants to have a stone border (along all 4 edges of the garden and inside of the garden) of uniform width. The stone border should use 100 square feet of crushed stone. How wide should the border be in inches?



103. The following data relates the weight of trees (in kilograms) and their circumferences (in meters):

| weight | circumference |
|--------|---------------|
| 8.4 | 0.188 |
| 23.5 | 0.314 |
| 94.2 | 0.628 |
| 135.7 | 0.753 |
| 159.2 | 0.816 |

Using a quadratic fit, estimate the circumference of a tree weighing 75 kilograms to three decimal places.

104. Is the following a valid statement?

$$(x - 5)^2 = x^2 + 25$$

105. How many of the following the equations are of quadratic type:

- $2x^{-6} + x^{-12} = 4$
- $x^{-7} = x^{-3} + 1$
- $x^{12} + 8x^3 = 3$
- $x^{12} - 7x^6 = 2$
- $x^{1/2} - 7x = 45$

106. How many of the following equations can be transformed into an equation of quadratic type by making a substitution of the form $u = x^n$?

- $2x^{-4} + x^{-2} + 8 = 0$
- $x^5 + 5x^2\sqrt{x} - 12 = 0$
- $5x^6 - 2x^2 + 3 = 0$
- $\frac{1}{x^4} + \frac{1}{x^2} = 2$

107. Solve. $\sqrt{4x+8} = 12$

108. Solve algebraically: $5x^{-2/3} - 7x^{-1/3} + 1 = 0$

109. Solve. $10x^{-2} + 2x^{-1} + 1 = 0$

110. Solve for x : $x = \sqrt{37x^2 + 64}$

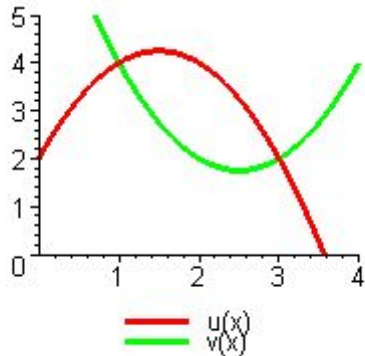
111. Solve. $\sqrt{5x+1} - 1 = 3x$

112. Solve. $1 - 10x^{-2} + 15x^{-4} = 0$

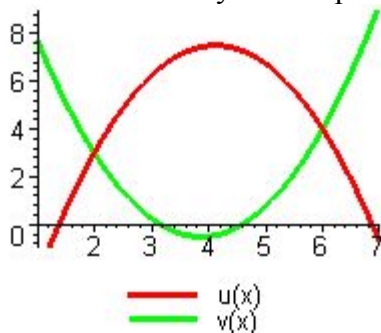
113. Solve. $x + 5\sqrt{x} - 24 = 0$

114. A rectangular plot of land has a diagonal of 22 feet and an area of 235 square feet. Find the dimensions of the rectangle, correct to one decimal place.

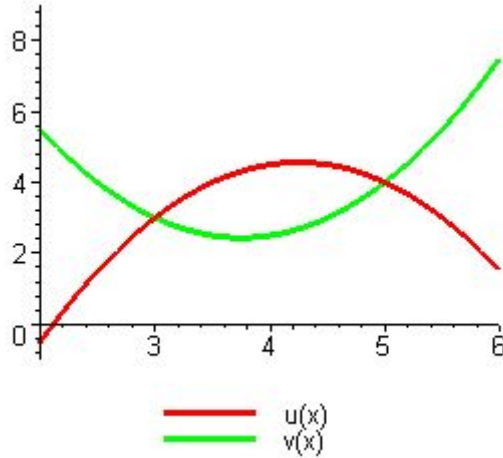
115. A small paper drinking cup in the shape of a right circular cone is constructed from $\sqrt{3}\pi \approx 5.44$ square inches of paper. If the height of the cone is 2 inches, find the radius at the top of the cup correct to two decimal places.
116. The diagonal of a rectangle is 5.728 centimeters and the area is 16.4 centimeters. Find the dimensions of the rectangle, correct to one decimal place.
117. If the splash of a stone dropped into a well is heard 2.75 seconds after the stone is released, how far below ground is the water level (to the nearest foot)? (Assume the sound travels infinitely fast).
118. Use the graphs of $y = u(x)$ and $y = v(x)$ shown below to determine the values of x which best correspond to $u(x) \geq v(x)$. (Assume that the graphs continue with the same slopes as indicated beyond the portions shown here.)



119. Use the graphs of $y = u(x)$ and $y = v(x)$ shown below to determine the values of x which best correspond to $u(x) - v(x) < 0$. (Assume that the graphs continue with the same slopes as indicated beyond the portions shown here.)



120. Use the graphs of $y = u(x)$ and $y = v(x)$ shown below to solve the inequality $u(x) < v(x)$. (Assume that the graphs continue with the same slopes as indicated beyond the portions shown here.)



121. Write as an absolute value inequality.
 x is more than 5 units from 10.
122. Write the inequality as a verbal statement about distance.
 $|x| > 8$
123. Solve.
 $5x - 9 < 9x - 4$
124. Solve.
 $(x + 2)(x - 8) \leq 0$
125. Solve. Write the solution in interval notation.
 $|x + 3| \leq 1$
126. Solve. Write the solution in interval notation.
 $|x - 8| \geq 10$
127. Solve the inequality $\frac{x}{3} > -3$.

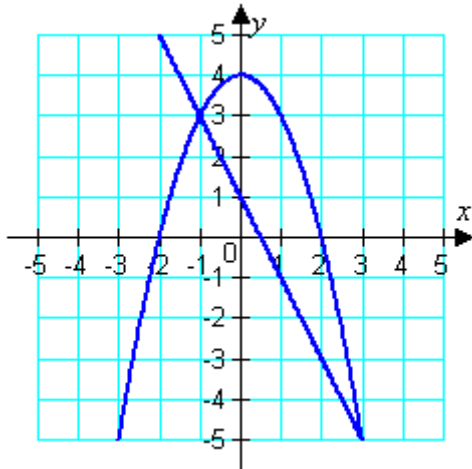
128. Solve the inequality $\frac{x}{2} + 3 < 6$.
129. Solve the inequality $\frac{x}{6} + 4 \geq 4$.
130. Solve the inequality $|5x + 2| \leq 5$.
131. Solve the inequality $|2x + 1| \leq 3$.
132. Solve and write your answer in interval notation.
 $0 < |x - 1| < 0.01$
133. Find the interval(s) where the function is positive.
 $f(x) = x^2 + 7x - 8$
134. A textbook publisher plans to market a new algebra textbook. The fixed costs associated with the text's publication are \$320,000, and the variable costs are \$31 per textbook. The text will be sold to retailers for \$105. How many texts must be sold for the publisher to show a profit? Round to the nearest whole number.

Answer Key

1. $3x + 4y = 8$
2. rise = 1; run = 5; slope = $1/5$
3. x-intercept = -2 ; y-intercept = -4 ; slope = -2
4. x-intercept = -3 ; y-intercept = 4 ; slope = $4/3$
5. ii and iii
6. slope is $\frac{7}{4}$, x-intercept is $\frac{1}{3}$, y-intercept is $-\frac{7}{12}$.
7. $x = 4$
8. $x = 5$
9. $y = 1$
10. $y = 7x - 4$
11. $8x - 5y = -25$
12. $y = \frac{11}{10}x + \frac{7}{2}$
13. $y = \frac{5}{4}x - 11$
14. $y = -\frac{2}{9}x + 2$
15. $y = -\frac{1}{2}x + \frac{7}{2}$
16. $f(x) = -\frac{17}{4}x + 25$
17. 160
18. 30
19. $x = c$ and $x = d$
20. $x = b$ and $x = e$
21. $x = b$ and $x = e$
22. identity
23. conditional equation
24. contradiction
25. -3
26. 2
27. 11
28. $\frac{7}{5}$
29. No solution
30. -16
31. No solution
32. -16
33. $-\frac{1}{5}$
34. $\frac{95}{22}$
35. $r = \frac{E}{I} - R$
36. $R_1 = \frac{R_2 \cdot f \cdot (n-1)}{R_2 - f \cdot (n-1)}$
37. $\frac{ab}{(a+b)}$
38. $x = \frac{7y+3}{y-1}$
39. $b = a + 10$
40. identity; $x \neq -4$ and $x \neq 0$
41. 8, 10, 12, 14
42. \$34,909.33
43. 315 mi
44. 15 gallons
45. 120,421
46. Linear least-squares models:
Men: $y = -0.1115x + 270.944$
Women: $y = -0.1617x + 376.703$
Setting the models equal and solving for x yields $x \approx 146.79$.
Yes, the models indicate that the women will catch up with the men in $1958 + 146 = 2104$.
47. \$2.35 per bushel

48. Vertex: $(-4, -5)$; axis: $x = -4$
 49. The graph is reflected in the x axis, then shifted 2 units to the right and 4 units down.
 50. $x^2 - 5x + \frac{25}{4}$
 51. $f(x) = 4(x + 3)^2 - 7$
 52. $f(x)$ is increasing on $(-\infty, -\frac{1}{4})$ and decreasing on $(-\frac{1}{4}, \infty)$

53. 8
 54. 7
 55. $y = x^2 - 10x + 30$
 56. $x^2 - 2x + 3$
 57. Secant line: $g(x) = -2x + 1$



58. 9,900 feet
 59. imaginary, complex
 60. -9
 61. $-8 - 7i$

62. $-48 - 60i$
 63. 40
 64. $63 + 6i$
 65. $\frac{44}{25} - \frac{33}{25}i$
 66. $\frac{11}{10} + \frac{9}{5}i$
 67. $9i$
 68. $11 - 2i$
 69. $(15 + \sqrt{33}) + (3\sqrt{11} - 5\sqrt{3})i$
 70. $1 - i$
 71. $-3 + i$
 72. $-4 - 6i$
 73. $-i$
 74. $x = 2, y = -3$
 75. $x = 3, y = -4$
 76. $x = -10, y = 10$
 77. $\frac{2}{5} + \frac{6}{5}i$
 78. $z = 2 - i$
 79. $9u^2 + 5v^2 - 44uvi$

80. Rationalize the denominator by multiplying by its conjugate and then simplify:

$$\frac{c + di}{a - bi} = \frac{c + di}{a - bi} \cdot \frac{a + bi}{a + bi} = \frac{(c + di)(a + bi)}{a^2 + b^2} = \frac{ca - bd + (cb + ad)i}{a^2 + b^2}$$

81. $i^{4k+3} = i^{4k} \cdot i^3 = (i^4)^k \cdot i^2 \cdot i = (1)^k \cdot (-1) \cdot i = -i$
 82. $S_n = -i$ if $n = 4m + 1$, $-i - 1$ if $n = 4m + 2$, -1 if $n = 4m + 3$, and 0 if $n = 4m + 4$
 83. $-9, -\frac{2}{3}$
 84. $-9, 7$
 85. $-4, 3$
 86. $(t - 4)^2 - 16 = 0$, so that $(t - 4) - 4 = 0$ (so that $t = 8$), or $(t - 4) + 4 = 0$ (so that $t = 0$).

87. $5 \pm \sqrt{3}$
88. $3 \pm \sqrt{11}$
89. two distinct real zeros
90. two distinct real zeros
91. two real zeros
92. $x = 2 \pm 14i$
93. $\frac{-3 \pm \sqrt{33}}{12}$
94. $b = Z \pm \sqrt{\frac{f}{k}}$
95. $x = -3.99$ and $x = 1.75$
96. $\frac{7 \pm \sqrt{105}}{4}$
97. $x = \pm 2.65$
98. $x = 4i, x = 8i$
99. $\pm 1, \pm i$
100. Yes
101. 14 and 16
102. 5.0 inches
103. 0.555 meters
104. Not valid
105. three of them
106. 3 of them
107. 34
108. $x = \frac{(7 \pm \sqrt{29})^3}{8}$
109. $-1 \pm 3i$
110. $\frac{4}{3}i$
111. $0, -\frac{1}{9}$
112. $\pm\sqrt{5 \pm \sqrt{10}}$ (four roots)
113. 9
114. 13.6 feet by 17.3 feet
115. 0.80 inches
116. 4 centimeters by 4.1 centimeters
117. 121 feet
118. $[1, 3]$
119. $(\infty, 2)$ and $(6, \infty)$
120. $(\infty, 3)$ and $(5, \infty)$
121. $|x - 10| > 5$
122. x is more than 8 units away from the origin.
123. $x > -\frac{5}{4}$
124. $-2 \leq x \leq 8$
125. $[-4, -2]$
126. $(-\infty, -2] \cup [18, \infty)$
127. $x > -9$
128. $x < 6$
129. $x \geq 0$
130. $-\frac{7}{5} \leq x \leq \frac{3}{5}$
131. $-2 \leq x \leq 1$
132. $(0.99, 1.01)$
133. $(-\infty, -8) \cup (1, \infty)$
134. 4324 or more texts