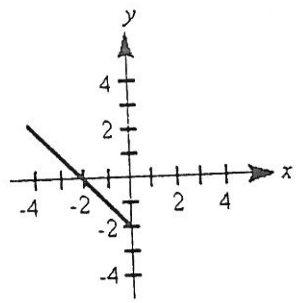
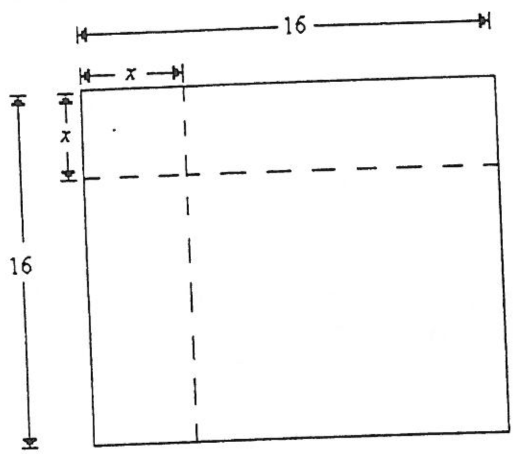
Midterm Review Packet for Honors Algebra II

Attached is a packet of problems that span the material that will be covered on the Midterm Examination. The answers for each problem are also included at the end of the packet. Any problem that states, "using a graphing utility" must be completed without the use of a graphing utility due to the fact that you will not be allowed to use a graphing calculator on the exam.

1. Sketch the complete graph of the equation if the graph has y-axis symmetry.



2. Strips of width x are cut from two sides of a square that is 16 inches on a side. Write the area A of the remaining square as a function of x.



3. Given $f(x) = 2x^2 + 1$ for $x \geq 0$, find $f^{-1}(x)$.

4. Describe the subset of real numbers represented by the inequality: $x < 3$.

5. Use a graphing utility to graph $y = x^2 - 2x + 5$. Use the graph to approximate the x-intercepts. Then set $y = 0$ and solve the equation. Compare the result with the x-intercepts of the graph.

6. Simplify: $(-3x^2)^3(3x^2)^2$.

X The growth of the number of employees hired by a company has been linear for the past ten years, starting at 415 ten years ago and currently standing at 495. Estimate the number of employees that will be employed two years from now (by linear extrapolation).

8. Find the x-intercept(s) and the y-intercept(s) of the graph of the equation $y = x^2 - 3x - 4$.

9. Factor: $14x^2 - 19x - 3$.

10. ~~Use a graphing utility to~~ graph the quadratic function and identify the vertex and x-intercepts: $f(x) = -2x^2 - 4x - 3$.

11. The sum of two numbers is 26. The larger number is one less than twice the smaller number. Find the numbers.

12. Solve $0.55 + 13.9(2.1 - x) = 14$ for x. Round your result to two decimal places.

13. graph the equation and approximate any x-intercepts of $y = 2(-3x + 1) - 4$. Then set $y = 0$ and solve the resulting equation.

14. Use absolute value notation to describe: y is closer to 5 than y is to -6.

15. Convert to radical form: $(8xy^2z^4)^{3/2}$.

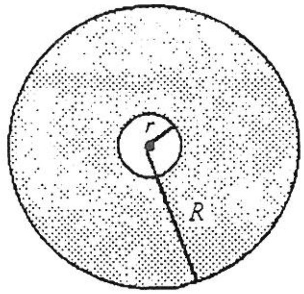
16. A group of people could rent a social hall for \$500. When 15 more people join the venture the cost per person is decreased by \$7.50. How many people are in the larger group?

17. Find the equation of the line that passes through $(-1, 5)$ and has a slope of 2.

18. Use a calculator to evaluate the expression. Round your answer to two decimal places.

$$\frac{2.41(3.86 - 10.25)}{2.42}$$

19. Find the surface area of a compact disc with outside radius, R, and inside radius, r, then factor that expression.



20. Identify the property illustrated by $1 \cdot (x + 7) = x + 7$.

21. The area of a triangle is given by $A = \frac{1}{2}bh$ where A is in square inches when b and h are in inches. The height of a triangle is 4 inches shorter than the base and its area is 198 square inches. Find the base and height.

22. Find the x-intercept(s) and the y-intercept(s) of the graph of the equation $y = -2x + 6$.

23. Use a graphing utility to determine the interval(s) on the real axis for which $f(x) \geq 0$ for $f(x) = \sqrt{x^2 - 4}$.

24. Use absolute value notation to define the interval: $x < -3$ or $x > 3$.

25. graph the function $f(x) = \sqrt{x^2 - 4}$. Then determine the domain and range.

26. A person rides a bicycle at a constant rate of 18 miles per hour for M miles. Write an expression for the time in hours elapsed.

27. Write in standard form: $(3x^2 + 2x) + x(1 - 7x) + (2x + 5)$.

28. Use the Quadratic Formula to solve for x: $4x^2 - 4x + 3 = 0$, and write your answer in standard form.

29. Solve for x: $\dfrac{2x - 5}{x - 3} = \dfrac{4x + 1}{2x}$.

30. Solve the equation $2(2 - x) = 3(x + 8)$

31. Determine if 3 is a solution to the equation $5 + \dfrac{1}{x - 4} = 4$.

32. Factor: $(2x - 1)(x + 3) + (2x - 1)(2x + 1)$.

33. Find the inverse of f informally: $f(x) = \dfrac{x}{3}$.

34. Use the rules of exponents to write without negative exponents.

$$\left[\frac{3x^2}{y^{-2}}\right]^{-1}$$

35. Use the rules of exponents to write without negative exponents.

$$\left[\frac{b^2}{3a}\right]^{-2}$$

36. Solve the inequality: $|x + 5| \le 2$.

37. Determine which of the two equations represents y as a function of x and specify why the other does not.

(a) $x^2 + y^2 = 4$ (b) $x^2 + y = 4$

38. Simplify and write the answer without negative exponents.

$$\frac{-3y^{-2}}{(2y)^{-3}}$$

39. Given $f(x) = \sqrt[3]{x - 1}$ and $g(x) = x - 4$, find $(f^{-1} \circ g^{-1})(-2)$.

40. A ball is shot vertically upward at a speed of 32 feet per second. The equation that relates the position, s, of the ball as a function of time, t, is $s = 32t - 16t^2$, $0 \le t \le 2$. Sketch the graph over the interval.

41. Use a graphing utility to determine the interval(s) over which the function is increasing: $f(x) = -\frac{1}{3}x^3 + \frac{1}{2}x^2 + 2x$.

42. Write an algebraic expression for the distance traveled in t hours at an average speed of 55 miles per hour.

43. A train makes a round trip between cities 300 miles apart. On the return half, the average speed is 25 mph faster than the average speed on the trip out and takes 1 hour less time. Find the time required on the return trip.

44. Graph the solution: $\frac{1}{2} < 3 - x < 5$.

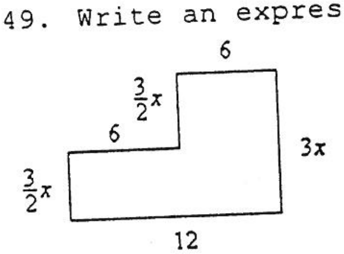
45. Curtis Area Schools had an enrollment of 2800 students in 1990 and 12,600 in 1998. Assuming the growth is linear, write an equation of the enrollment, E, in terms of the year using $t = 0$ for 1990.

46. The sum of three consecutive even integers is 24. Find the integers.

47. Find the domain of $\sqrt{36 - x^2}$.

48. Use a graphing utility to graph the quadratic function and identify the vertex and x-intercepts: $f(x) = x^2 - 2x + 3$.

49. Write an expression for the area of the region.



50. The depreciated value y of a certain machine after t years is determined using the model $y = 36{,}000 - 4300t$, $0 \le t \le 5$. Sketch the graph of the equation over the given interval.

51. Use the discriminant to determine the number of real solutions: $10x = x^2 - 14x + 50$.

52. The function $y = \sqrt{0.5x + 10}$, $0 \le x \le 10$ approximates the population of a small town in thousands where x is the year with $x = 0$ representing 1990. Find the inverse function. What does each variable represent in the function?

53. Find the zeros of the function $f(x) = \dfrac{3x + 1}{6x - 4}$.

54. Find the slope of the line passing through (2, 7) and (-8, 7).

55. Multiply, then simplify: $\dfrac{x^2 - 5x + 4}{x^2 + 4} \cdot \dfrac{x + 2}{x^2 + 3x - 4}$.

56. Rationalize the denominator: $\dfrac{x}{3 - \sqrt{x + 9}}$.

57. Perform the operation and simplify: $\dfrac{x^{4/3}y^{1/3}}{(xy)^{2/3}}$.

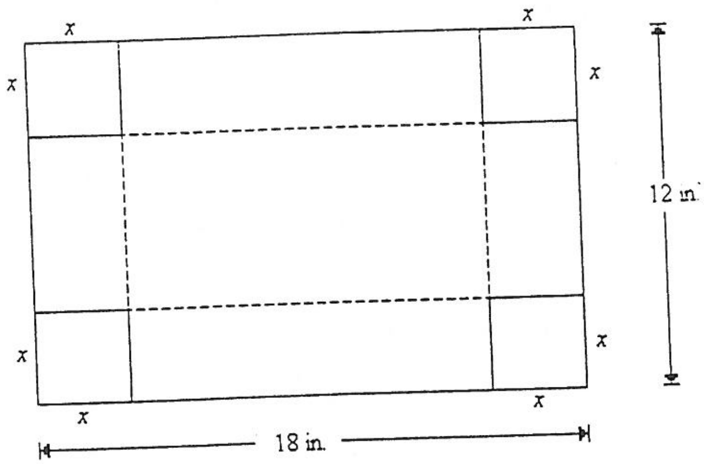
58. The area of a rectangle is 56 square yards. Its length is 2 yards more than three times its width. Find its dimensions.

59. Perform the operation and simplify: $\dfrac{x^{-1/2} \cdot x^{1/3}}{x^2 \cdot x^{-3}}$.

60. Let $A = \{0, 2, 4\}$ and $B = \{1, 3, 5\}$. Fill in the missing number so that the set of ordered pairs represents a function from A to B.
$\{(0, 3), (\ \ , 5), (2, 1)\}$

61. Solve the equation $3(x - 6) = 2 + 2(x - 5)$.

62. An open box is made from a rectangular piece of material by cutting equal squares from each corner and turning up the sides. Write the volume of the box as a function of x if the material is 18 inches by 12 inches.



63. Graphically, determine whether the functions $f(x) = \sqrt{x^2 - 5}$ and $g(x) = x^2 + 5$ are inverses of each other.

64. Use absolute value notation to define the interval: $-7 \le x \le 7$.

65. $F(x) = -1 + 2x - x^2$, find $F(k + 1)$ and simplify.

66. Write in the form $y = a(x - h)^2 + k$: $y = -x^2 + 3x - 2$.

67. The Curriers have decided to fence in part of their back yard to form a rectangular region with an area of 1248 square feet. The fence will extend 2 feet on each side of their 48-foot wide house. How many feet of fencing will they need to enclose the play area? (There is no fence along the house wall.)

68. The weekly cost of producing x units in a manufacturing process is given by the function $C(x) = 30x + 400$. If the number of units produced in t hours is given by $x(t) = 75t$, find $(C \circ x)(t)$.

69. The area of a rectangle is 270 square feet. Its perimeter is 66 feet. Find its dimensions.

70. Find the inverse of f informally: $f(x) = x + 5$.

71. The formula that converts Celsius temperature to Fahrenheit temperature is $F = \dfrac{9}{5}C + 32$. Find the Celsius temperature that corresponds to 98.6° F.

72. Solve the linear equation $5(3x - 2) + 5x - 7 = 16 + 2x$.

73. The height in feet of a ball thrown by a child is

$$y = -\frac{1}{2}x^2 + 2x + 3$$

where y is the horizontal distance (in feet) when the ball is thrown. Graph the function using a graphing utility. Use the graph to estimate the maximum height the ball reaches.

74. Find the x-intercept(s) and the y-intercept(s) of the graph of the equation $y^2 = x + 9$.

75. Simplify, then write your result in standard form: $\dfrac{3 - 7i}{3 + 7i}$.

76. Find all real values of x such that $f(x) = 0$: $f(x) = x^3 - 2x^2 - 5x$.

77. The sum of two numbers is 27, and one number is twice the other. Find the numbers.

78. Solve for x: $x^2 - 3x + \dfrac{3}{2} = 0$.

79. Find the slope of the line passing through $(3, 7)$ and $(-1, -2)$.

80. Simplify: $\dfrac{2x^{-5}y^2}{z^2}$.

81. Solve for x: $2x^2 + x = 3$.

82. Solve the equation and round your answer to two decimal places:
$$5x + \frac{5.2}{6} = \frac{3}{2}.$$

83. Find all real values of x for which $f(x) = g(x)$.
$f(x) = x^2 - 5$, $g(x) = x + 1$

84. Simplify: $(-3x^2)^3(-3x)^2$.

85. Sketch the graph of the function: $f(x) = \begin{cases} 3x - 1, & x < 1 \\ x^2 + 1, & x \geq 1 \end{cases}$.

86. Solve for x: $4ax - 3(x + 5) = -4x + 13$.

87. Solve for x: $\dfrac{3}{4}x - \dfrac{1}{2}(x + 5) = 2$.

88. Subtract, then simplify: $\dfrac{3}{x} - \dfrac{9}{x + 1}$.

89. Express the area, A, of a square as a function of the length, x, of a side.

90. The number of public elementary and secondary classroom teachers, in thousands, in the United States from 1990 to 1998 can be modeled by

$$f(t) = \begin{cases} 33.2t + 2368, & 0 \le t \le 3 \\ 48.7t + 2319, & 4 \le t \le 8 \end{cases}$$

where t is the year with $t = 0$ corresponding to 1990. Use this model to find the Number of classroom teachers in 1995. (Source: *National Education Association*)

91. Expand: $[(x - 1) + y]^2$.

92. Use a calculator to evaluate the expression. Round to three decimal places.

$$\frac{2^6}{3^4}$$

93. The sale price, S, of a product is equal to the list price, L, minus the discount. The discount may be expressed as a percent, R, of the list price. Write an equation for the sale price in terms of the list price and discount, then factor that expression.

94. Solve the equation $3x - [5 - 2(1 - 2x)] = 7x - 5$.

95. Solve for x: $8x^3 - 343 = 0$.

96. Determine which of the two equations represents y as a function of x and specify why the other does not.

(a) $y^2 - 4y = x$ (b) $x^2 - 4x = y$

97. Use a graphing utility to graph $y = x^3 - 7x^2 + 12x$. Approximate any x-intercepts. Set $y = 0$ and solve the equation.

98. Perform the operation and simplify: $\dfrac{5^{5/3}}{5^{2/3}}$.

99. Determine the domain and range of the function $f(x) = 3 - x^2$.

100. evaluate the expression.

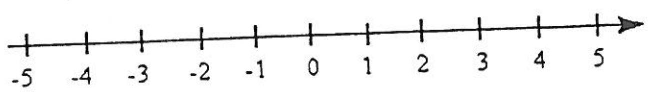
$$\frac{2^{-5}}{3^{-4}}$$

101. Solve the inequality: $x^3 - 2x^2 - 16x + 32 > 0$.

102. Convert to rational exponent form: $\sqrt[3]{125} = 5$.

103. Restrict the domain of the function $f(x) = (x - 1)^2$ so that it is one-to-one. Then find the inverse and give its domain.

104. Plot the real numbers on the number line: $\left\{\frac{2}{3}, -4, 1 -\frac{3}{2}, 2\right\}$.



105. After t seconds, the height in feet of an object dropped from a hot air balloon is given by:

Height $= 300 - 16t^2$.

Find the height after 2.5 seconds.

106. Evaluate: $\left(\frac{8}{27}\right)^{-2/3}$.

107. Solve the equation and round your answer to two decimal places:

$$\frac{x}{5.25} = 3x + 10.25.$$

108. Write the expression as a repeated multiplication: -3^4.

109. Use a calculator to approximate the number. Round to three decimal places.

$$\frac{3 + \sqrt{21}}{5}$$

110. Solve by completing the square: $2x^2 - 7x - 12 = 0$.

111. Find the zeros of the function $f(x) = 2x^3 - 8x$.

112. Solve the equation and round your answer to two decimal places:
$1.576x + 4 = 5.5$.

113. Find an equation of the line that passes through (8, 17) and is perpendicular to the line $x + 2y = 2$.

114. Find the slope of the line passing through (-1, -3) and (-1, 4).

115. The cost of producing x units in a manufacturing process is given by the function $C(x) = 1.25x + 65$. The revenue obtained from selling x units is given by $R(x) = 2.75x - 0.0025x^2$. Determine the profit as a function of the number of units sold if $P = R - C$.

116. Simplify: $3\sqrt[3]{4x^5y^3} + 7x\sqrt[3]{32x^2y^6}$.

117. Express the volume, V, of a cube as a function of the length, x, of a side.

118. Without using a variable, write a verbal description of $\dfrac{3}{x + 2}$.

119. Use a graphing utility to graph $y = x(x + 6)$. Use a standard setting. Approximate any intercepts.

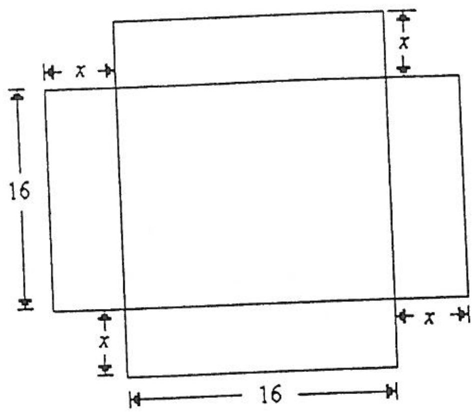
120. Find the quadratic function that has a minimum at $\left(\frac{1}{2}, \frac{3}{4}\right)$ and passes through (2, 6).

121. Find the zeros of the function $f(x) = 6x^2 - 19x + 10$.

122. The list price of your purchase is \$492.95, but you receive an 18% discount. The sales tax is 5.5%. How much do you owe?

123. Use a graphing utility to graph the equation and approximate any x-intercepts of $y = 3(x - 1) + 6$. Then set $y = 0$ and solve the resulting equation.

124. Strips of width x are added to the four sides of a square, which are 16 inches on a side. Write the area A of the remaining figure as a function of x.



125. Graph the solution $|3x - 1| > 9$.

126. The volume of the frustum of a cone can be found by using the formula $V = \frac{1}{3}(a^2\pi h + ab\pi h + b^2\pi h)$. Write the formula in factored form.

127. Use a graphing utility to graph $y = \sqrt{2x - 1} - 2$. Approximate any x-intercepts. Set $y = 0$ and solve the equation.

128. Solve for x: $5(x + 2)^2 + (x + 2) - 4 = 0$.

129. Perform the operations. Write fractional answers in reduced form.

$$\frac{2}{5} - \frac{1}{3} + \frac{3}{10}$$

130. Write in lowest terms: $\dfrac{2x^2 + 5x - 3}{6x - 3}$.

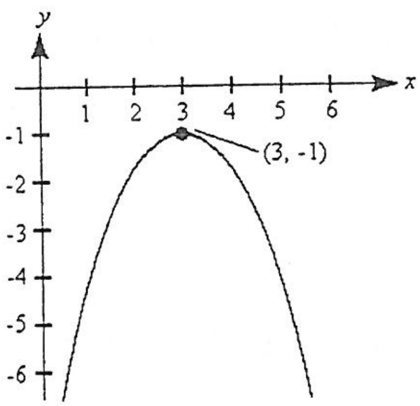
131. Solve by completing the square: $x^2 - 8x + 2 = 0$.

132. $F(x) = 5 + 2x - x^2$, find $F(k + 1) - F(k - 1)$ and simplify.

133. Evaluate: $5x^2 - 2x - 1$ for $x = -1$.

134. Find the domain of the function: $g(x) = \dfrac{5x}{x^2 - 7x + 12}$.

135. Write the standard form of the equation of the parabola.



136. After t seconds, the height in feet of an object dropped from a hot air balloon is given by:

Height $= 300 - 16t^2$.

Find the height after 1.5 seconds.

137. Solve the inequality: $(x - 2)^2 \le 9$.

138. The height of an object dropped from an initial height of 350 feet is given by $h = 350 - 16t^2$, where t is in seconds and h is in feet. How many seconds (to two decimal places) has the object been falling when it strikes the ground? (Ignore any air resistance.)

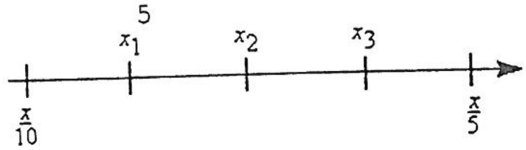
139. Use a calculator to approximate the number. Round to three decimal places.

$\sqrt[3]{51}$

140. Given $f(x) = x^3 + 4$ and $g(x) = \sqrt[3]{x}$, find $(f \circ g)(-3)$.

141. Find the domain of the function: $f(x) = \dfrac{2x - 1}{2x + 1}$.

142. Find three real numbers that divide the real number line between $\dfrac{x}{10}$ and $\dfrac{x}{5}$ into four equal parts.



143. Solve the inequality: $x^2 - x > 6$.

144. Sketch the graph of the function $f(x) = \begin{cases} -x, & \text{if } -2 \le x < 0 \\ 1 & \\ -x^2, & \text{if } 0 \le x \le 2 \\ 4 & \end{cases}$.

145. Use the Quadratic Formula to solve for x: $5x^2 - 2x + 6 = 0$.

146. Perform the operation and simplify: $2^{3/2} \cdot 2^{5/2}$.

147. Solve for x: $7x^3 = 252x$.

148. The selling price, S, of a product is equal to the cost, C, plus the markup. The markup may be expressed as a percent, R, of the cost. Write an equation for the selling price in terms of the cost and markup, then factor that expression.

149. Determine the domain and range of the function $f(x) = x^3 - 3$.

150. Determine which of the two equations represents y as a function of x and specify why the other does not.

(a) $|x| + y = 4$ (b) $x + |y| = 4$

151. Two cars, starting together, travel in opposite directions on a highway, one at 55 mph and the other at 45 mph. How far apart are they after $2\frac{1}{2}$ hours?

152. A cash register contains x quarters and y dimes. Write an expression for the total amount of money in *cents*.

153. Simplify: $\sqrt[3]{\sqrt{3x + 1}}$.

154. graph the function $f(x) = 1 - \sqrt{x}$. Then determine the domain and range.

155. Simplify: $(\sqrt[3]{81x^4y^9})(\sqrt[3]{2xy^2})$.

156. How many ounces of pure antifreeze must be added to 100 ounces of 40% antifreeze solution to obtain a 60% solution?

157. Solve for x: $\sqrt[3]{4x - 1} = 3$.

158. A grocer wants to mix cashew nuts worth \$8 per pound with peanuts worth \$3 per pound. She wants to obtain a mixture to sell for \$4 per pound. If ten pounds of peanuts are used, what is the total weight of the mixture?

159. Given $f(x) = \dfrac{2x + 1}{3}$, find $f^{-1}(x)$.

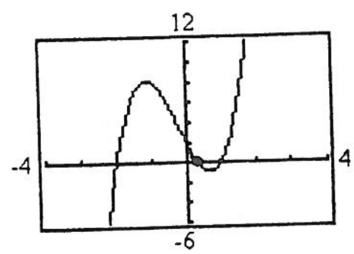
160. A rectangular room has a volume of $2x^3 - 17x + 3$ cubic feet. The height of the room is $x + 3$. Find the algebraic expression for the number of square feet of floor space in the room.

161. An open box is to be made from a 14-inch square piece of material by cutting equal squares from each corner and turning up the sides. Verify the volume of the box is $V(x) = 4x(7 - x)^2$. Graph the function using a graphing utility and use the graph to estimate the value of x for which $V(x)$ is maximum.

162. Use a graph utility to graph the function: $f(x) = 2x^3 - 3x^2$.

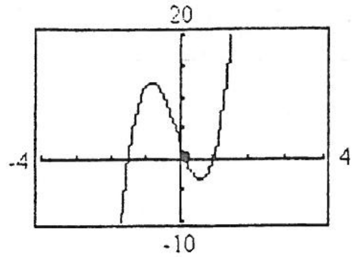
163. Find all the real zeros of the polynomial function: $f(x) = x^3 - 4x$.

164. Use the root-finding capabilities of a graphing utility to approximate the indicated zero. Use synthetic division to verify your result and then factor the polynomial completely: $f(x) = 3x^3 + 2x^2 - 7x + 2$.



165. Use a graph utility to graph the function: $f(x) = x^4 + 2x^3 + 1$.

166. Use the root-finding capabilities of a graphing utility to approximate the indicated zero. Use synthetic division to verify your result and then factor the polynomial completely: $f(x) = 10x^3 + 3x^2 - 16x - 3$.



167. Use a graph utility to graph the function: $f(x) = -2x^4 + x$.

168. Factor the polynomial $x^3 + 2x^2 - 7x - 14$ completely if $(x + 2)$ is a factor.

169. Use synthetic division to divide: $(x^4 + 2x^2 - x + 1) \div (x - 2)$.

170. Determine the left-hand and right-hand behavior of the graph: $f(x) = 3x^4 + 2x^3 + 7x^2 + x - 1$.

171. An open box is to be made from an 8-inch square piece of material by cutting equal squares from each corner and turning up the sides. Verify the volume of the box is $V(x) = 4x(4 - x)^2$. Graph the function using a graphing utility and use the graph to estimate the value of x for which $V(x)$ is maximum.

172. Divide: $(6x^4 - 4x^3 + x^2 + 10x - 1) \div (3x + 1)$.

173. Use a graph utility to graph the function: $f(x) = -x^5 + 4$.

174. Determine the left-hand and right-hand behavior of the graph: $f(x) = -4x^3 + 3x^2 - 1$.

175. A rectangular room has a volume of $4x^3 - 7x^2 - 16x + 3$ cubic feet. The height of the room is $x - 3$. Find the algebraic expression for the number of square feet of floor space in the room.

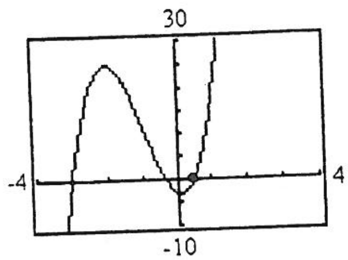
176. Divide: $(2x^4 + 7x - 2) \div (x^2 + 3)$.

177. Factor the polynomial $3x^3 - 2x^2 - 15x + 10$ completely if $\frac{2}{3}$ is a zero.

178. Find all the real zeros of the polynomial function:

$$f(x) = \frac{1}{4}x^2 + \frac{1}{2}x - \frac{3}{4}.$$

179. Use the root-finding capabilities of a graphing utility to approximate the indicated zero. Use synthetic division to verify your result and then factor the polynomial completely: $f(x) = 6x^3 + 17x^2 - 4x - 3$.



180. Simplify, then write your result in standard form:

$$\left(\frac{4}{5} + \frac{2}{3}i\right) - \left(\frac{3}{4} - \frac{1}{2}i\right)$$

181. Simplify, then write your result in standard form:

$$3(2 - \sqrt{-9}) + 2i(4i - 7).$$

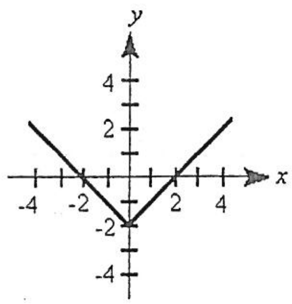
182. Simplify, then write your result in standard form: $\dfrac{3 + 7i}{3 - 7i}$.

183. Factor: $12u^3 - 3u + 4u^2 - 1$.

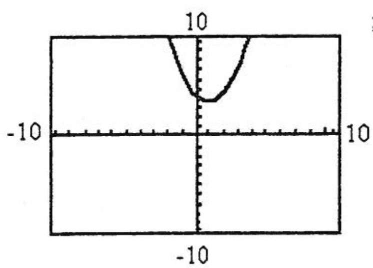
184. Factor completely: $3x - 24x^4$.

Page 1

1. See graph below

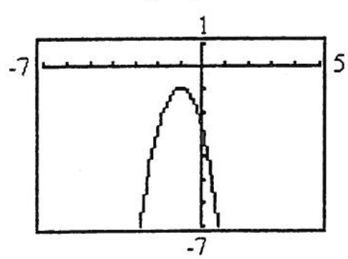


2. $A(x) = (16 - x)^2$ or $A(x) = 256 - 32x + x^2$
3. $$f^{-1}(x) = \sqrt{\frac{x-1}{2}}$$
4. The set of real numbers that are less than 3.
5. See graph below.



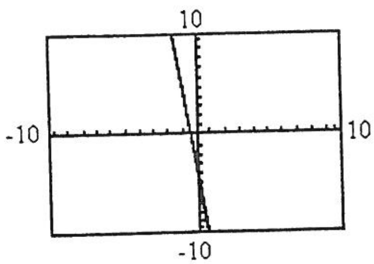
; $x = 1 \pm 2i$; no x-intercepts

6. $-243x^{10}$
7. 511
8. x-intercepts: (-1, 0), (4, 0)
   y-intercept: (0, -4)
9. $(2x - 3)(7x + 1)$
10. See graph below.



; (-1,-1); no x-intercepts

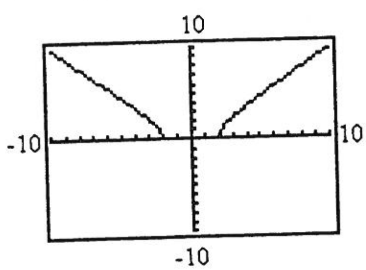
11. 9, 17
12. 1.13
13. See graph below.



; ~~(3, 0)~~; $x = 3$

$\left(\frac{-1}{3}, 0\right)$

14. $|y - 5| < |y + 6|$
15. $\sqrt{(8xy^2z^4)^3}$
16. 40
17. $2x - y + 7 = 0$
18. -6.36
19. $A = \pi R^2 - \pi r^2 \Rightarrow$
    $A = \pi(R^2 - r^2)$
20. Identity
21. $b = 22$ inches and $h = 18$ inches
22. x-intercept: (3, 0)
    y-intercept: (0, 6)
23. $(-\infty, -2], [2, \infty)$
24. $|x| > 3$
25. See graph below.



; Domain: $(-\infty, -2], [2, \infty)$, Range: $[0, \infty)$

26. $\frac{M}{18}$
27. $-4x^2 + 5x + 5$
28. $x = \frac{1}{2} \pm \frac{\sqrt{2}}{2} i$
29. -3
30. $x = -4$
31. Yes
32. $(2x - 1)(3x + 4)$
33. $f^{-1}(x) = 3x$
34. $\frac{1}{3x^2y^2}$

35. $\dfrac{9a^2}{b^4}$

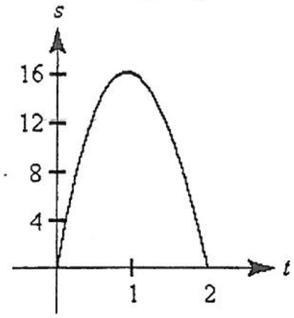
36. $-7 \le x \le -3$

37. (b); in (a), some values of x determine more than one value of y.

38. $-24y$

39. 9

40. See graph below.

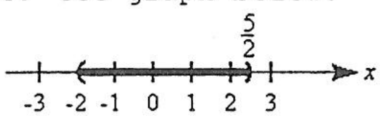


41. (-1, 2)

42. $55t$

43. 3 hours

44. See graph below.

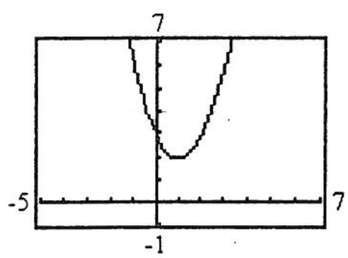


45. $E = 1225t + 2800$

46. 6, 8, 10

47. [-6, 6]

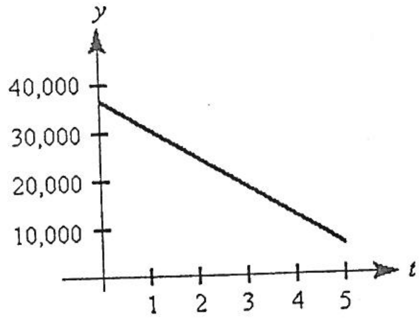
48. See graph below.



; (1, 2); no x-intercepts

49.
$$A = \begin{bmatrix}3\\ -x\\ 2\end{bmatrix}(6) + \begin{bmatrix}3\\ -x\\ 2\end{bmatrix}(12) = 27x \text{ or } \begin{bmatrix}3\\ -x\\ 2\end{bmatrix}(6) + (3x)(6) = 27x$$

50. See graph below.



51. 2

52. $y = 2(x^2 - 10) = 2x^2 - 20, \; x \geq \sqrt{10}$

y is the year with $y = 0$ is representing 1990 in terms of x, and x is population in thousands of a small town.

53. $x = -1/3$

54. 0

55. $\dfrac{x^2 - 2x - 8}{(x^2 + 4)(x + 4)}$

56. $-(3 + \sqrt{x + 9})$

57. $\dfrac{x^{2/3}}{y^{1/3}}$

58. 4 yards by 14 yards

59. $x^{5/6}$

60. 4

61. $x = 10$

62. $V = x(12 - 2x)(18 - 2x)$

63. No, they are not inverses of each other.

64. $|x| \leq 7$

65. $-k^2$

66. $y = -\left(x - \dfrac{3}{2}\right)^2 + \dfrac{1}{4}$

67. 104 feet

68. $(C \circ x)(t) = 2250x + 400$

69. 18 feet by 15 feet

70. $f^{-1}(x) = x - 5$

71. 37° C

72. $\dfrac{11}{6}$

73. The maximum height ≈ 5 feet.

86. $x = \dfrac{28}{4a + 1}$

87. 18

88. $\dfrac{3(1 - 2x)}{x(x + 1)}$ or $\dfrac{3 - 6x}{x(x + 1)}$

89. $A(x) = x^2$

90. 2563 thousand teachers

91. $x^2 - 2x + 1 + 2xy - 2y + y^2$

92. 0.790

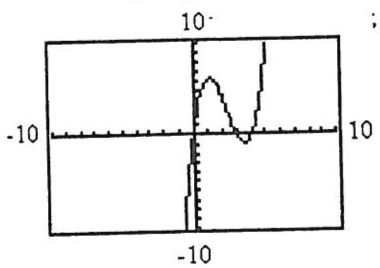
93. $S = L - RL \Rightarrow S = L(1 - R)$

94. $x = \dfrac{1}{4}$

95. $x = \dfrac{7}{2}, \dfrac{-7 \pm 7\sqrt{3}i}{4}$

96. (b); in (a), some value of x determine more than one value of y.

97. See graph below.



; (0, 0), (3, 0), (4, 0); $x = 0, 3, 4$

98. 5

99. Domain: $(-\infty, \infty)$, Range: $(-\infty, 3]$

100. 2.531

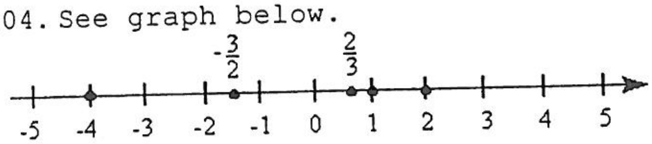
101. $(-4, 2) \cup (4, \infty)$

102. $125^{1/3} = 5$

103. Possible answers: $f(x) = (x - 1)^2, x \geq 1$ or $f(x) = (x - 1)^2, x \leq 1$

$f^{-1}(x) = 1 + \sqrt{x}, x \geq 0$ or $f^{-1}(x) = 1 - \sqrt{x}, x \geq 0$

104. See graph below.

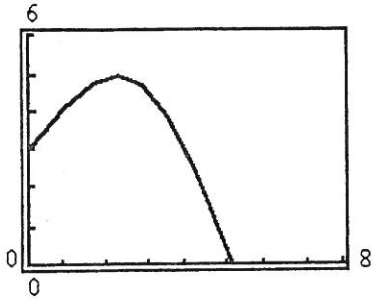


105. 200 feet

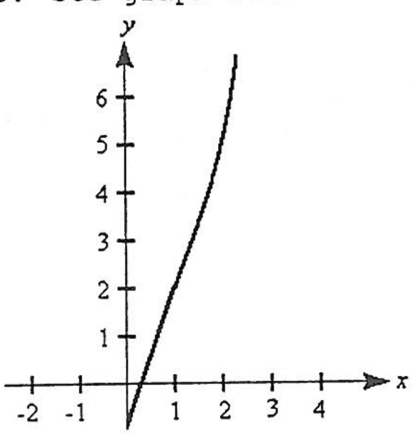
106. $\dfrac{9}{4}$

107. $x = -3.65$

108. $-(3 \cdot 3 \cdot 3 \cdot 3)$ or -81



74. x-intercept: $(-9, 0)$
y-intercepts: $(0, 3)$, $(0, -3)$
75. $-\frac{20}{29} - \frac{21}{29}i$
76. $x = 0,\ 1 \pm \sqrt{6}$
77. 9, 18
78. $\frac{3 \pm \sqrt{3}}{2}$
79. $\frac{9}{4}$
80. $\frac{2y^2}{x^5 z^2}$
81. $-\frac{3}{2}$, 1
82. $x = 0.13$
83. -2, 3
84. $-243x^8$
85. See graph below.



109. 1.517

110. $\frac{1}{4}(7 \pm \sqrt{145})$

111. $x = 2,\ x = 0,\ x = -2$

112. $x = 0.95$

113. $y = 2x + 1$

114. slope is undefined.

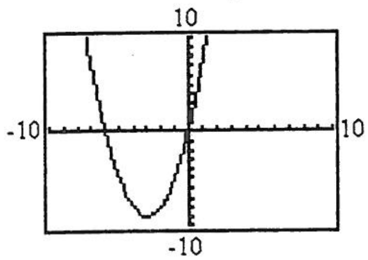
115. $P = -0.0025x^2 + 1.50x - 65$

116. $(3 + 14y)xy\sqrt[3]{4x^2}$

117. $V(x) = x^3$

118. Three is divided by the sum of two and a number.
NOTE: Verbal descriptions are not unique.

119. x-intercepts: $(-6, 0)$, $(0, 0)$; y-intercept: $(0, 0)$

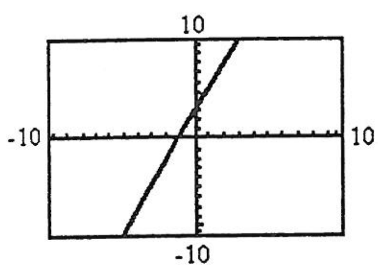


120. $f(x) = \frac{7}{3}\left(x - \frac{1}{2}\right) + \frac{3}{4}$

121. $x = 5/2,\ x = 2/3$

122. $426.45

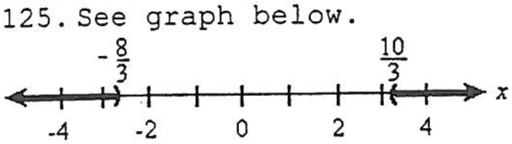
123. See graph below.



; $(-1, 0)$; $x = -1$

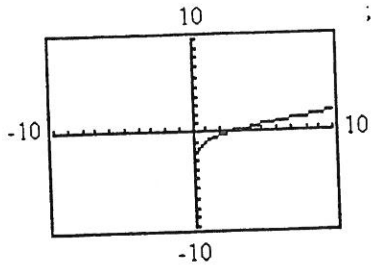
124. $A(x) = 64x + 256$

125. See graph below.



126. $V = \frac{1}{3}\pi h(a^2 + ab + b^2)$

127. See graph below. $;(\frac{5}{2},0)\ x=\frac{5}{2}$



128. $x = \frac{-6}{5}, -3$

129. $\frac{11}{30}$

130. $\frac{x+3}{3}$

131. $4 \pm \sqrt{14}$

132. $4 - 4k$

133. 6

134. All real numbers $x \neq 3$, $x \neq 4$

135. $f(x) = -(x-3)^2 - 1$

136. 264 feet

137. [-1, 5]

138. 4.68 seconds

139. 3.708

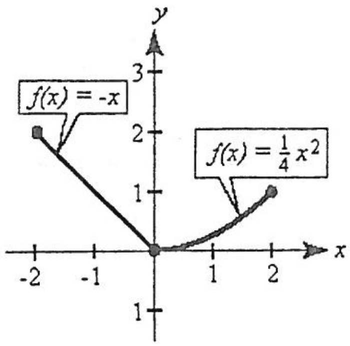
140. 1

141. All real numbers $x \neq -\frac{1}{2}$

142. $x_1 = \frac{x}{8}$, $x_2 = \frac{3x}{20}$, and $x_3 = \frac{7x}{40}$

143. $(-\infty, -2) \cup (3, \infty)$

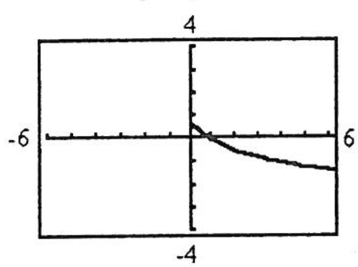
144. See graph below.



145.

$$x = \frac{1 + \sqrt{29i}}{5}$$

146. 16
147. ±6, 0
148. $S = C + RC \Rightarrow S = C(1 + R)$
149. Domain: $(-\infty, \infty)$, Range: $(-\infty, \infty)$
150. (a); in (b), some values of x determine more than one value of y.
151. 250 miles
152. $25x + 10y$
153. $\sqrt[6]{3x + 1}$
154. See graph below.



; Domain: $[0, \infty)$, Range: $(-\infty, 1]$

155.

$3xy^3\sqrt{6x^2y^2}$

156. 50 ounces
157. 7
158. 12.5 pounds
159.

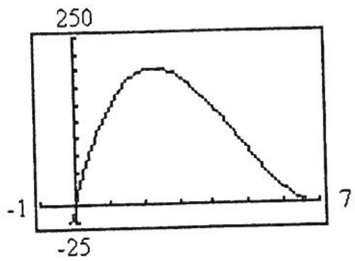
$$f^{-1}(x) = \frac{3x - 1}{2}$$

160. $2x^2 - 6x + 1$
161. $V(x) = x \cdot (14 - 2x) \cdot (14 - 2x)$

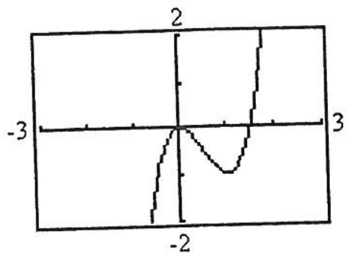
$= x \cdot 2(7 - x) \cdot 2(7 - x)$

$= 4x(7 - x)^2$

When $x \approx 2.33$ inches, $V(x)$ is a maximum ≈ 203.3 inches^3.



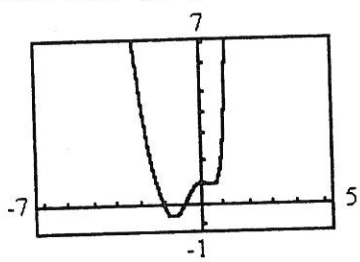
162. See graph below.



163. -2, 0, 2

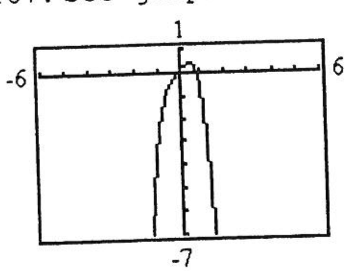
164. $x = \frac{1}{3}$; $f(x) = (3x - 1)(x + 2)(x - 1)$

165. See graph below.



166. $x = \frac{1}{5}$; $f(x) = (5x - 1)(2x + 3)(x - 1)$

167. See graph below.



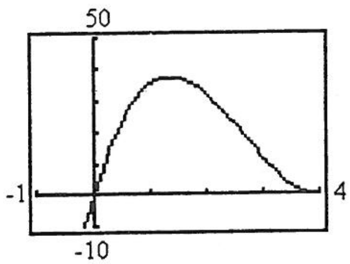
168. $(x + 2)(x + \sqrt{7})(x - \sqrt{7})$

169. $x^3 + 2x^2 + 6x + 11 + \dfrac{23}{x - 2}$

170. Up to the left and right

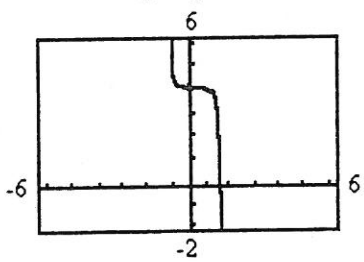
171. $V(x) = x \cdot (8 - 2x) \cdot (8 - 2x)$
$= x \cdot 2(4 - x) \cdot 2(4 - x)$
$= 4x(4 - x)^2$

When $x \approx 1.33$ inches, $V(x)$ is a maximum ≈ 37.9 inches^3.



172. $2x^3 - 2x^2 + x + 3 - \dfrac{4}{3x + 1}$

173. See graph below.



174. Up to the left, down to the right

175. $4x^2 + 5x - 1$

176. $2x^2 - 6 + \dfrac{7x + 16}{x^2 + 3}$

177. $(3x - 2)(x + \sqrt{5})(x - \sqrt{5})$

178. 1, -3

179. $x = \dfrac{1}{2}$, $f(x) = (2x - 1)(x + 3)(3x + 1)$

180. $\dfrac{1}{20} + \dfrac{7}{6}i$

181. $-2 - 23i$

182. $-\dfrac{20}{29} + \dfrac{21}{29}i$

183. $(4u^2 - 1)(3u + 1)$
184. $3x(1 - 2x)(1 + 2x + 4x^2)$