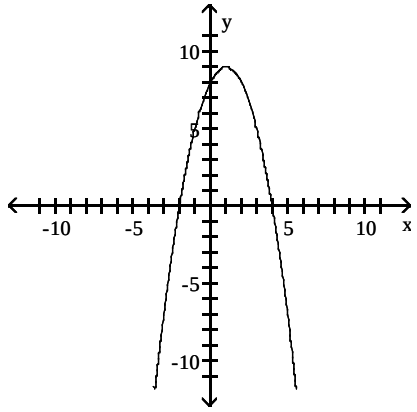
Math 141
Exam 3 Preparation Ch.3.1 to 3.8 v02
NO BOOK/ NO NOTES/YES CALCUATOR
Dressler Winter 2016

Name_____

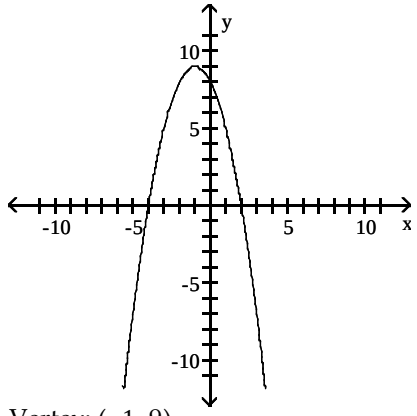
Determine the quadratic function whose graph is given by first writing in standard form.
Express your answer in both standard form and the form $ax^2 + bx + c$.

1) 1) _____



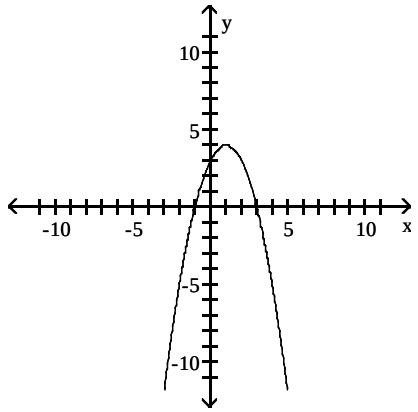
Vertex: (1, 9)
y–intercept: (0, 8)

2) 2) _____



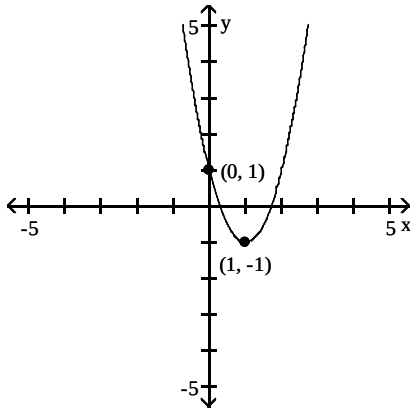
Vertex: (- 1, 9)
y–intercept: (0, 8)

3) 3) _____

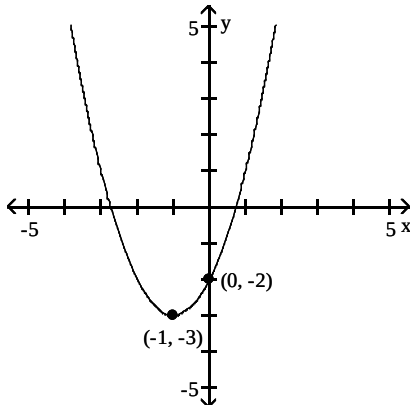


Vertex: (1, 4)
y–intercept: (0, 3)

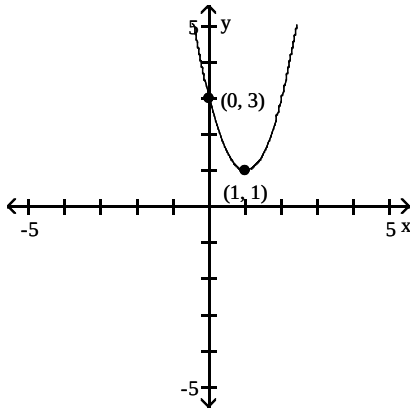
4) 4) _____



5) 5) _____



6) 6) _____



Solve the problem.

7) You have 68 feet of fencing to enclose a rectangular plot that borders on a river. If you do not fence the side along the river, find the length and width of the plot that will maximize the area. 7) _____

8) You have 116 feet of fencing to enclose a rectangular plot that borders on a river. If you do not fence the side along the river, find the length and width of the plot that will maximize the area. 8) _____

9) You have 120 feet of fencing to enclose a rectangular plot that borders on a river. If you do not fence the side along the river, find the length and width of the plot that will maximize the area. 9) _____

10) You have 92 feet of fencing to enclose a rectangular plot that borders on a river. If you do not fence the side along the river, find the length and width of the plot that will maximize the area. 10) _____

11) The cost in millions of dollars for a company to manufacture x thousand automobiles is given by the function $C(x) = 3x^2 - 18x + 63$. Find the number of automobiles that must be produced to minimize the cost. 11) _____

12) The cost in millions of dollars for a company to manufacture x thousand automobiles is given by the function $C(x) = 3x^2 - 12x + 28$. Find the number of automobiles that must be produced to minimize the cost. 12) _____

Use synthetic division to find the quotient and the remainder when the first polynomial is divided by the second polynomial.

13) $x^3 - 5$; $x - 1$ 13) _____

14) $3x^4 - 3x^2 - 1$; $x - \frac{1}{2}$ 14) _____

15) $3x^4 - 2x^2 - 1$; $x + \frac{1}{2}$ 15) _____

16) $x^5 + 9x^4 + 20x^3 + 14x^2 + 15x + 20$; $x + 6$ 16) _____

17) $x^5 - 4x^4 - 15x^3 + 21x^2 - 21x + 19$; $x - 6$ 17) _____

18) $2x^4 + 5x^2 - 1$; $x - \frac{1}{3}$ 18) _____

19) $3x^4 + 4x^2 - 1$; $x + \frac{1}{2}$ 19) _____

Use the Factor Theorem to determine whether the linear polynomial is a factor of the second polynomial.

20) $x - 4$; $x^3 - 14x^2 + 61x - 84$ 20) _____

21) $x - 2$; $x^3 + 10x^2 + 19x - 30$ 21) _____

22) $x - 5$; $x^3 + 12x^2 + 23x - 36$ 22) _____

23) $x + 4$; $x^3 - 5x^2 - 22x + 56$ 23) _____

24) $x + 6$; $x^3 - 3x^2 - 40x + 84$ 24) _____

25) $x + 5$; $x^3 - 4x^2 - 31x + 70$ 25) _____

26) $x + 5$; $x^3 - 9x^2 + 8x + 64$ 26) _____

27) $x + 4$; $x^3 - 12x^2 + 24x + 108$ 27) _____

28) $x - 2$; $x^3 - 8x^2 + 21x - 18$ 28) _____

Find the set of possible rational zeros given the function.

29) $f(x) = 3x^3 + 63x^2 + 63x + 27$ 29) _____

30) $f(x) = 2x^3 + 7x^2 + 14x - 8$ 30) _____

31) $f(x) = 3x^3 + 66x^2 + 66x + 27$ 31) _____

32) $f(x) = 3x^3 + 53x^2 + 53x + 27$ 32) _____

33) $f(x) = 2x^3 - 5x^2 + 7x - 3$ 33) _____

34) $f(x) = 2x^3 - 5x^2 + 7x - 13$ 34) _____

35) $f(x) = 2x^3 - 5x^2 + 7x - 23$ 35) _____

36) $f(x) = 22x^7 + 88x^3 + 2x - 11$ 36) _____

37) $f(x) = 6x^7 + 24x^3 + 2x - 3$ 37) _____

Write the expression in the standard form a + bi.

38) i^{16} 38) _____

39) i^{12} 39) _____

40) i^{8} 40) _____

41) i^{3} 41) _____

42) i^{19} 42) _____

43) i^{5} 43) _____

44) i^{4} 44) _____

45) i^{9} 45) _____

46) i^{17} 46) _____

47) i^{13} 47) _____

48) i^{6} 48) _____

49) i^{10} 49) _____

50) i^{18} 50) _____

51) $2i^{15} - i^{7}$ 51) _____

52) $5i^{5}(1 + i^{3})$ 52) _____

53) $(1 + i)^{5}$ 53) _____

54) $i^{6} + i^{4} + i^{2} + 1$ 54) _____

55) $i^{14} + i^{12} + i^{10} + 1$ 55) _____

Solve the problem.

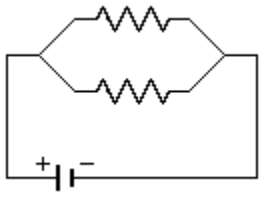
56) Ohm's law relates the current in a circuit, I, in amperes, the voltage of the circuit, V, in volts, and the impedance of the circuit, Z, in ohms, by the formula $Z = \frac{V}{I}$. Find V, the voltage of a circuit, if I = (8 + 3i) amperes and Z = (4 + 8i) ohms. 56) _____

57) Ohm's law relates the current in a circuit, I, in amperes, the voltage of the circuit, V, in volts, and the impedance of the circuit, Z, in ohms, by the formula $Z = \frac{V}{I}$. Find V, the voltage of a circuit, if I = (18 + i) amperes and Z = (2 + 3i) ohms. 57) _____

58) Ohm's law relates the current in a circuit, I, in amperes, the voltage of the circuit, V, in volts, and the impedance of the circuit, Z, in ohms, by the formula $Z = \frac{V}{I}$. Find the impedance, Z, when the voltage is V = (3 + 8i) volts and current is I = 7i amperes. 58) _____

59) Ohm's law relates the current in a circuit, I, in amperes, the voltage of the circuit, V, in volts, and the impedance of the circuit, Z, in ohms, by the formula $Z = \frac{V}{I}$. Find the current I when the impedance is Z = (10 – 6i) ohms and voltage is V = 9i volts. 59) _____

60) If two resistors are connected in parallel, the total impedance is given by $Z_T = \frac{Z_1 Z_2}{(Z_1 + Z_2)}$. Find the total impedance, Z_T, when the impedances Z_1 = (–10 + 4i) ohms and Z_2 = (10 – 8i) ohms are in parallel. 60) _____



Parallel Circuit

Use the given zero to find all zeros of the function.

61) $f(x) = x^4 - 12x^2 - 64$; zero: $-2i$ 61) _____

62) $f(x) = x^4 - 32x^2 - 144$; zero: $-2i$ 62) _____

63) $f(x) = x^3 + 6x^2 - 14x + 16$; zero: $1 + i$ 63) _____

64) $f(x) = x^3 + 2x^2 - 6x + 8$; zero: $1 + i$ 64) _____

65) $f(x) = x^3 - 2x^2 - 11x + 52$; zero: -4 65) _____

66) $f(x) = x^3 - 3x^2 - 5x + 39$; zero: -3 66) _____

67) $f(x) = x^3 - 2x^2 + 5x + 26$; zero: $2 + 3i$ 67) _____

68) $f(x) = x^3 - 7x^2 + 19x - 13$; zero: $3 + 2i$ 68) _____

69) $f(x) = 2x^4 - 15x^3 + 45x^2 - 45x + 13$; zero: $3 + 2i$ 69) _____

70) $f(x) = 2x^4 - 19x^3 + 71x^2 - 109x + 39$; zero: $3 + 2i$ 70) _____

71) $f(x) = x^5 - 10x^4 + 42x^3 - 124x^2 + 297x - 306$; zero: $3i$ 71) _____

72) $f(x) = x^5 - 10x^4 + 42x^3 - 124x^2 + 297x - 306$; zero: $3i$ 72) _____

Find the vertical asymptote(s), if any, of the graph of the rational function.

73) $g(x) = \frac{x + 4}{x - 1}$ 73) _____

74) $g(x) = \frac{x + 6}{x - 4}$ 74) _____

75) $h(x) = \frac{x^2 - 100}{(x - 8)(x + 6)}$ 75) _____

76) $h(x) = \frac{x^2 - 100}{(x - 5)(x + 3)}$ 76) _____

77) $f(x) = \frac{x^2 + 2x}{x^2 - 5x - 14}$ 77) _____

78) $f(x) = \dfrac{x^2 + 4x}{x^2 - 4x - 32}$ 78) _____

79) $f(x) = \dfrac{x - 4}{x^2 + 8}$ 79) _____

Find the horizontal asymptote(s), if any, of the graph of the rational function.

80) $g(x) = \dfrac{x^2 + 3x - 4}{x - 4}$ 80) _____

81) $g(x) = \dfrac{x^2 + 4x - 1}{x - 1}$ 81) _____

82) $g(x) = \dfrac{x + 5}{x^2 - 1}$ 82) _____

83) $g(x) = \dfrac{x + 5}{x^2 - 2}$ 83) _____

84) $h(x) = \dfrac{-5x + 1}{4x - 2}$ 84) _____

85) $h(x) = \dfrac{-5x - 3}{4x - 5}$ 85) _____

86) $g(x) = \frac{2x^2 - 5x - 5}{3x^2 - 9x + 9}$ 86) _____

87) $g(x) = \frac{2x^2 - 3x - 7}{8x^2 - 4x + 9}$ 87) _____

88) $g(x) = \frac{6x^2 - 7x - 4}{8x^2 - 6x + 9}$ 88) _____

89) $g(x) = \frac{7x^2 - 3x - 4}{3x^2 - 7x + 7}$ 89) _____

90) $g(x) = \frac{7x^2 - 9x - 4}{9x^2 - 6x + 4}$ 90) _____

91) $g(x) = \frac{x + 4}{x^2 - 9}$ 91) _____

92) $g(x) = \frac{x + 5}{x^2 - 5}$ 92) _____

93) $h(x) = \frac{x^2 - 16}{x + 4}$ 93) _____

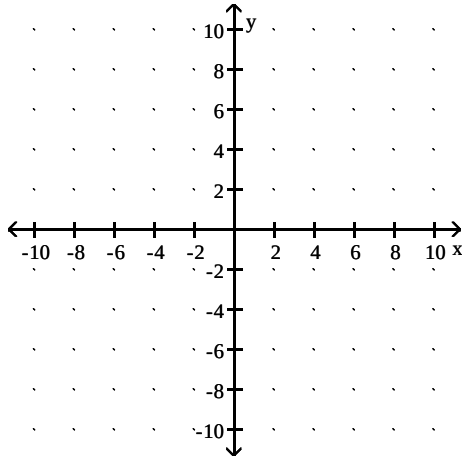
94) $h(x) = \dfrac{x^2 - 9}{x + 3}$ 94) _____

95) $f(x) = \dfrac{3x^2 + 7x - 4}{2x^3 - 4x + 8}$ 95) _____

96) $f(x) = \dfrac{5x^2 + 9x - 4}{3x^3 - 4x + 8}$ 96) _____

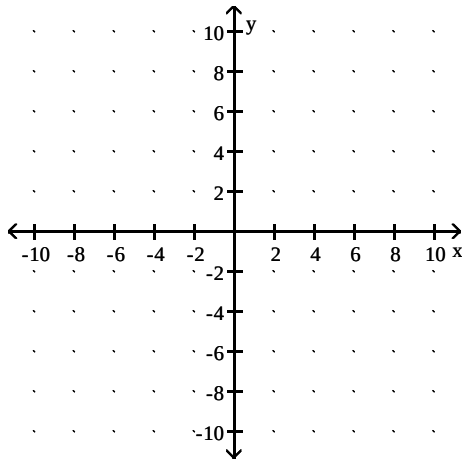
Graph the rational function and find the intercepts.

97) $f(x) = \dfrac{3x}{x - 2}$ 97) _____



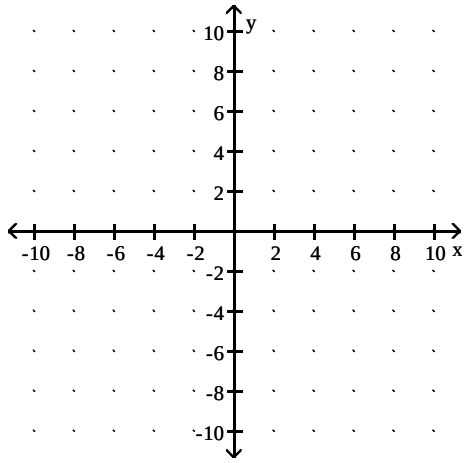
98) $f(x) = \frac{4x}{x - 2}$

98) _____

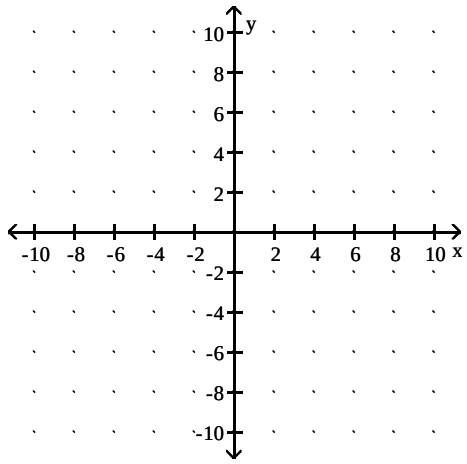


99) $f(x) = \frac{x}{x^2 - 1}$

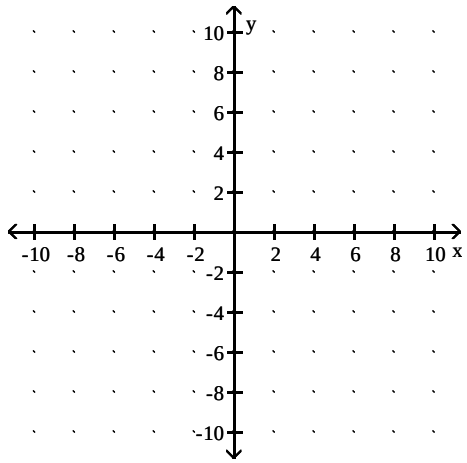
99) _____



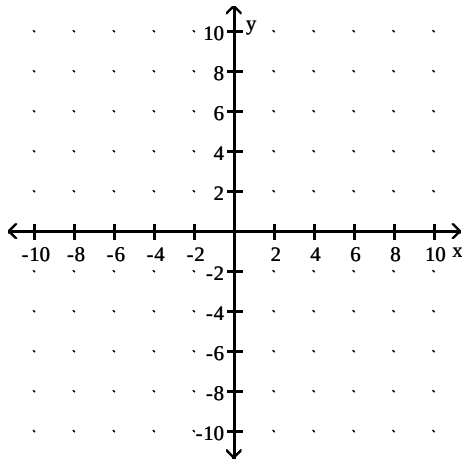
100) $f(x) = \dfrac{x}{x^2 - 16}$ 100) _____



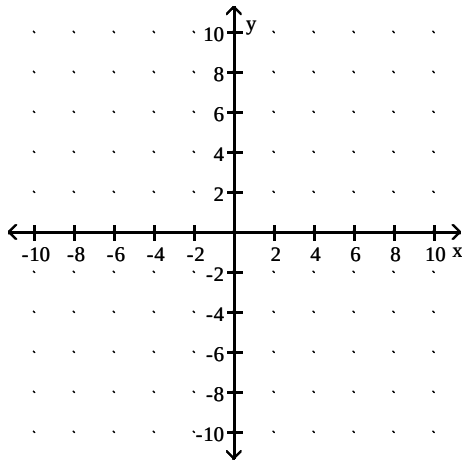
101) $g(x) = \dfrac{x^2}{9 - x^2}$ 101) _____



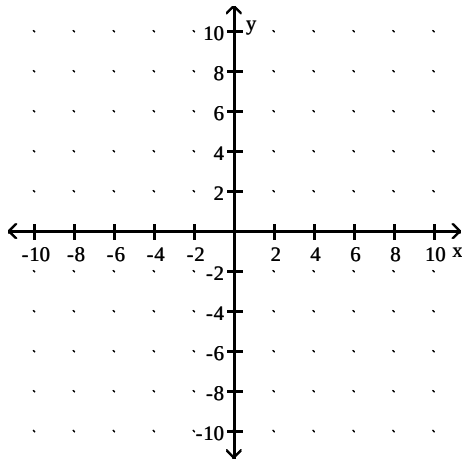
102) $g(x) = \dfrac{x^2}{1 - x^2}$ 102) _____



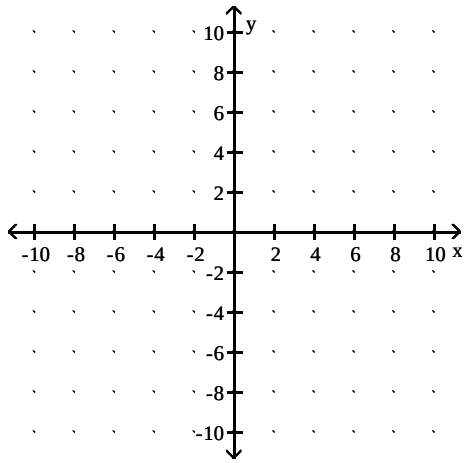
103) $h(x) = \dfrac{-5x^2}{x^2 - 1}$ 103) _____



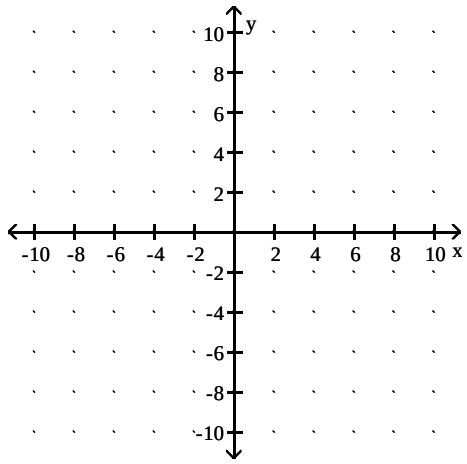
104) $h(x) = \dfrac{-5x^2}{x^2 - 4}$ 104) _____



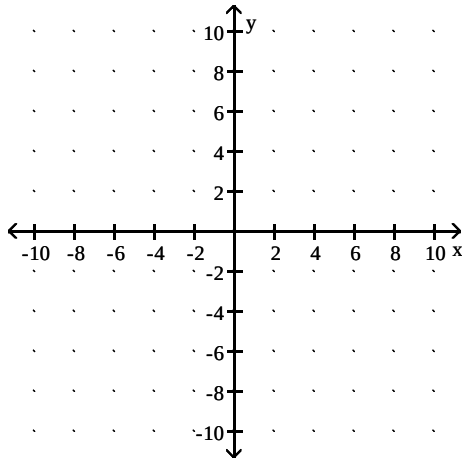
105) $f(x) = \dfrac{4}{x^2 - 5}$ 105) _____



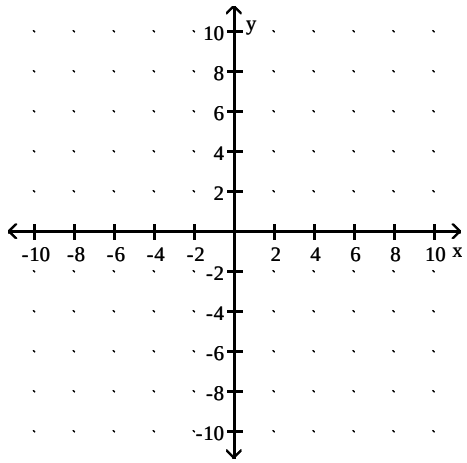
106) $f(x) = \dfrac{5}{x^2 - 5}$ 106) _____



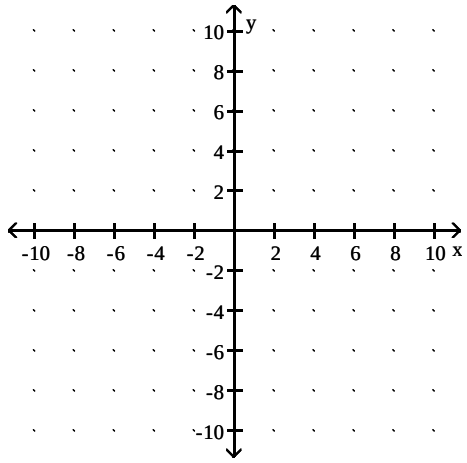
107) $g(x) = \dfrac{x - 2}{(x - 4)(x + 8)}$ 107) _____



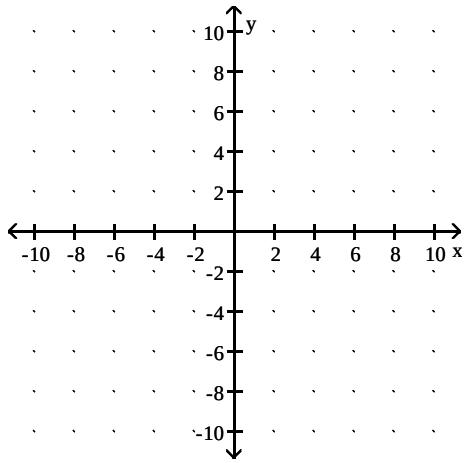
108) $g(x) = \dfrac{x - 5}{(x - 2)(x + 6)}$ 108) _____



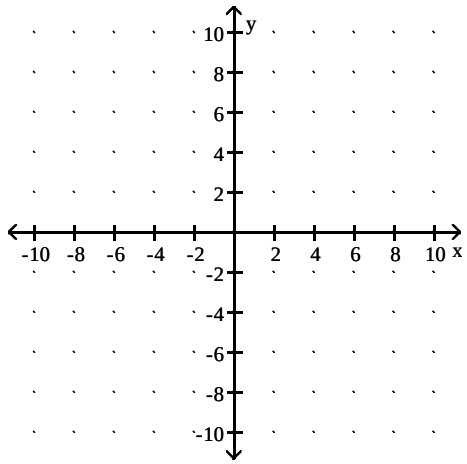
109) $h(x) = \dfrac{x^2}{x^2 + 25}$ 109) _____



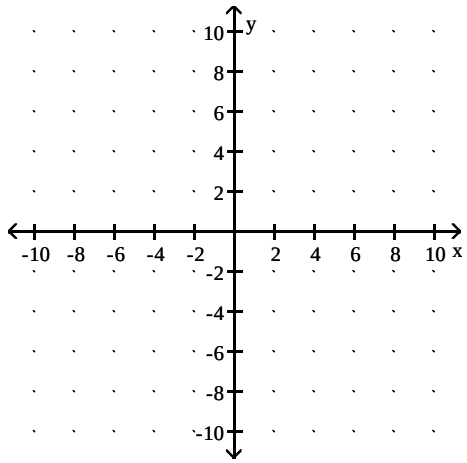
110) $h(x) = \dfrac{x^2}{x^2 + 4}$ 110) _____



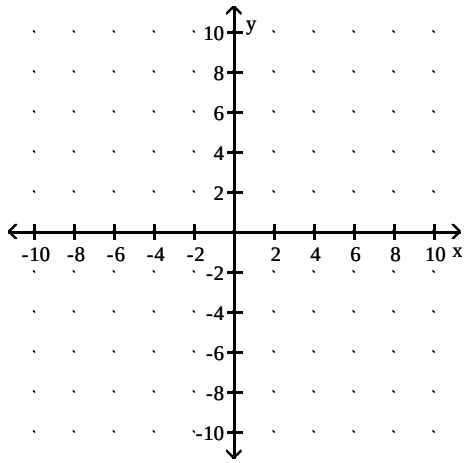
111) $f(x) = \dfrac{x^2 - 9}{x^2 - 16}$ 111) _____



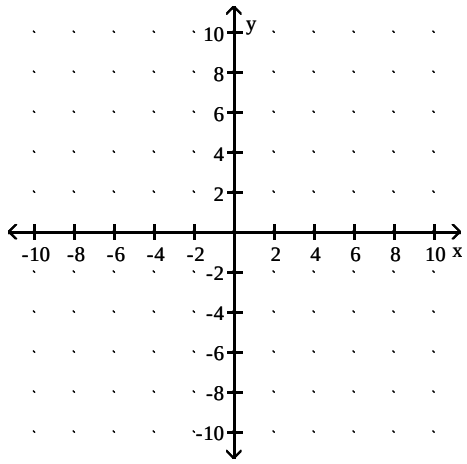
112) $f(x) = \dfrac{x^2 - 1}{x^2 - 4}$ 112) _____



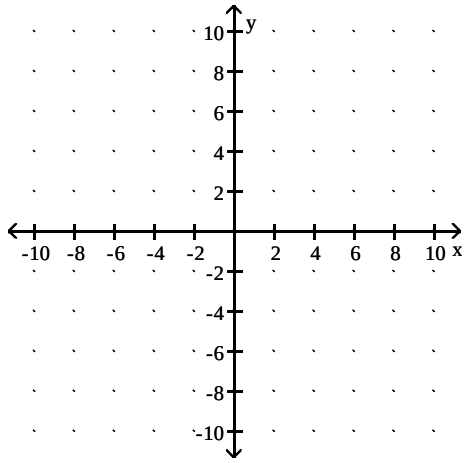
113) $g(x) = \dfrac{(x - 3)^2}{x - 3}$ 113) _____



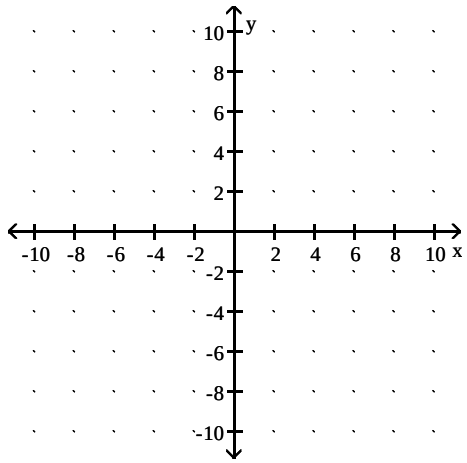
114) $g(x) = \dfrac{(x-6)^2}{x-6}$ 114) _____



115) $h(x) = \dfrac{(x-4)(x+4)(x-1)}{(x-4)(x+4)(x-1)}$ 115) _____



116) $h(x) = \dfrac{(x-2)(x+2)(x-1)}{(x-2)(x+2)(x-1)}$ 116) _____



Solve the inequality. Write the solution in interval notation.

117) $x^2 + 8x + 7 > 0$ 117) _____

118) $x^2 + 10x + 21 > 0$ 118) _____

119) $x^2 - 2x - 8 < 0$ 119) _____

120) $x^2 - 3x - 4 < 0$ 120) _____

121) $7x^4 < 70x^2$ 121) _____

122) $3x^5 < 15x^3$ 122) _____

123) $x^3 \geq 9x^2$ 123) _____

124) $x^3 \geq 7x^2$ 124) _____

125) $x^3 \geq 27$ 125) _____

126) $\frac{x-7}{x+8} < 0$ 126) _____

127) $\frac{x-6}{x+2} < 0$ 127) _____

128) $\frac{x-4}{x+3} < 1$ 128) _____

129) $\frac{x-3}{x+8} < 1$ 129) _____

130) $\frac{x-8}{x+7} < 1$ 130) _____

131) $\frac{x}{x-4} < 4$ 131) _____

132) $\frac{x-4}{x+7} > 0$ 132) _____

133) $\frac{x+13}{x+9} < 7$ 133) _____

134) $\frac{x+21}{x+3} < 8$ 134) _____

135) $\frac{(x-2)(x+2)}{x} \leq 0$ 135) _____

136) $\frac{(x-8)(x+8)}{x} \leq 0$ 136) _____

137) $\frac{(x+9)(x-5)}{x-1} \geq 0$ 137) _____

138) $\frac{(x+8)(x-5)}{x-1} \geq 0$ 138) _____

1) $f(x) = -x^2 + 2x + 8$
2) $f(x) = -x^2 - 2x + 8$
3) $f(x) = -x^2 + 2x + 3$
4) $f(x) = 2x^2 - 4x + 1$
5) $f(x) = x^2 + 2x - 2$
6) $f(x) = 2x^2 - 4x + 3$
7) length: 34 ft, width: 17 ft
8) length: 58 ft, width: 29 ft
9) length: 60 ft, width: 30 ft
10) length: 46 ft, width: 23 ft
11) 3 thousand automobiles
12) 2 thousand automobiles
13) quotient: $x^2 + x + 1$; remainder: -4
14) quotient: $3x^3 + \frac{3}{2}x^2 - \frac{9}{4}x - \frac{9}{8}$; remainder: $-\frac{25}{16}$
15) quotient: $3x^3 - \frac{3}{2}x^2 - \frac{5}{4}x + \frac{5}{8}$; remainder: $-\frac{21}{16}$
16) quotient: $x^4 + 3x^3 + 2x^2 + 2x + 3$; remainder: 2
17) quotient: $x^4 + 2x^3 - 3x^2 + 3x - 3$; remainder: 1
18) quotient: $2x^3 + \frac{2}{3}x^2 + \frac{47}{9}x + \frac{47}{27}$; remainder: $-\frac{34}{81}$
19) quotient: $3x^3 - \frac{3}{2}x^2 + \frac{19}{4}x - \frac{19}{8}$; remainder: $+\frac{3}{16}$
20) Yes
21) No
22) No
23) Yes
24) Yes
25) Yes
26) No
27) No
28) Yes
29) $\left\{\pm 1, \pm\frac{1}{3}, \pm 3, \pm 9, \pm 27\right\}$
30) $\left\{\pm 1, \pm\frac{1}{2}, \pm 2, \pm 4, \pm 8\right\}$
31) $\left\{\pm 1, \pm\frac{1}{3}, \pm 3, \pm 9, \pm 27\right\}$
32) $\left\{\pm 1, \pm\frac{1}{3}, \pm 3, \pm 9, \pm 27\right\}$
33) $\left\{\pm 1, \pm 3, \pm\frac{1}{2}, \pm\frac{3}{2}\right\}$
34) $\left\{\pm 1, \pm 13, \pm\frac{1}{2}, \pm\frac{13}{2}\right\}$
35) $\left\{\pm 1, \pm 23, \pm\frac{1}{2}, \pm\frac{23}{2}\right\}$

36) $\left\{\pm 1, \pm\frac{1}{2}, \pm 11, \pm\frac{11}{2}, \pm\frac{1}{11}, \pm\frac{1}{22}\right\}$

37) $\left\{\pm 1, \pm\frac{1}{2}, \pm 3, \pm\frac{3}{2}, \pm\frac{1}{3}, \pm\frac{1}{6}\right\}$

38) 1

39) 1

40) 1

41) –i

42) –i

43) i

44) 1

45) i

46) i

47) i

48) –1

49) –1

50) –1

51) –i

52) 5 + 5i

53) -4 - 4i

54) 0

55) 0

56) (8 + 76i) volts

57) (33 + 56i) volts

58) $\left(\frac{8}{7} - \frac{3}{7}i\right)$ ohms

59) $\left(-\frac{27}{68} + \frac{45}{68}i\right)$ amperes

60) $\left(-30 - 17i\right)$ ohms

61) 2i, 4, –4

62) 2i, 6, –6

63) 1 – i, –8

64) 1 – i, –4

65) 3 + 2i, 3 – 2i

66) 3 + 2i, 3 – 2i

67) 2 – 3i, –2

68) 3 – 2i, 1

69) 3 – 2i, 1, $\frac{1}{2}$

70) 3 – 2i, 3, $\frac{1}{2}$

71) –2, –3i, –4 – i, –4 + i

72) –2, –3i, –4 – i, –4 + i

73) x = 1

74) x = 4

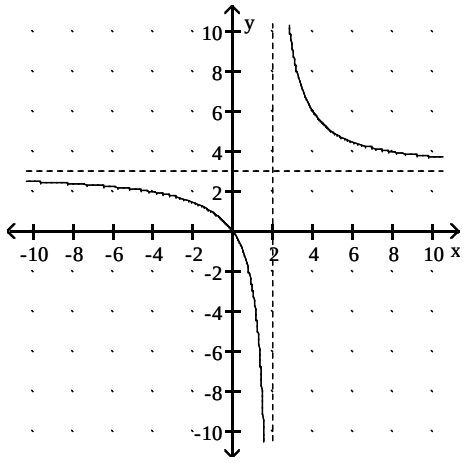
75) x = 8, x = –6

76) x = 5, x = –3

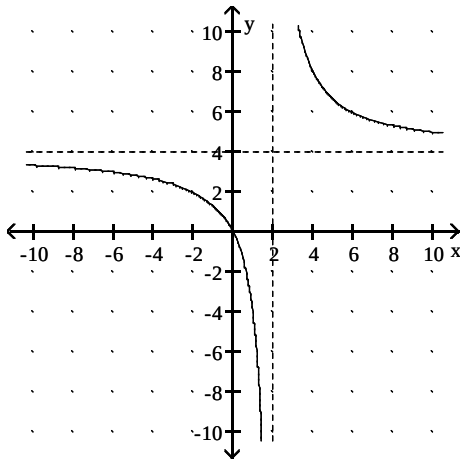
77) x = 7

78) x = 8

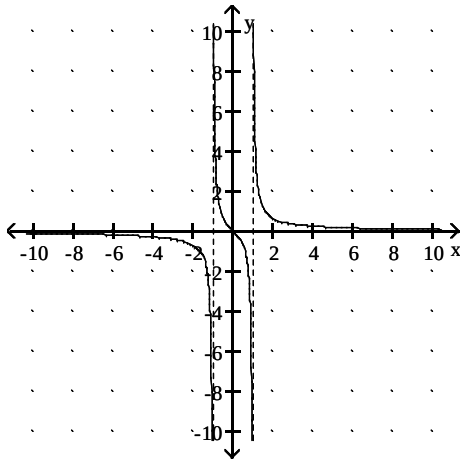
79) no vertical asymptote
80) no horizontal asymptote
81) no horizontal asymptote
82) y = 0
83) y = 0
84) $y = -\frac{5}{4}$
85) $y = -\frac{5}{4}$
86) $y = \frac{2}{3}$
87) $y = \frac{1}{4}$
88) $y = \frac{3}{4}$
89) $y = \frac{7}{3}$
90) $y = \frac{7}{9}$
91) y = 0
92) y = 0
93) no horizontal asymptote
94) no horizontal asymptote
95) y = 0
96) y = 0
97) x intercept: 0. y–intercept: 0.



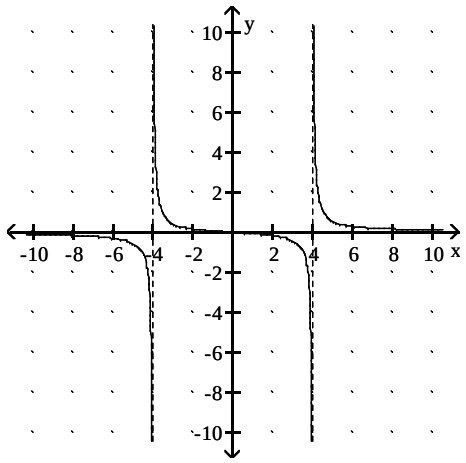
98) x intercept: 0. y–intercept: 0.



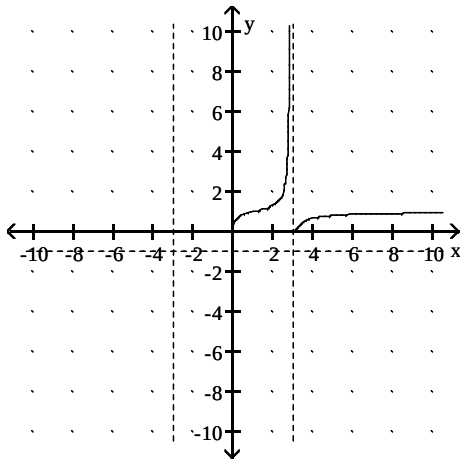
99) x–intercept: 0. y–intercept: 0.



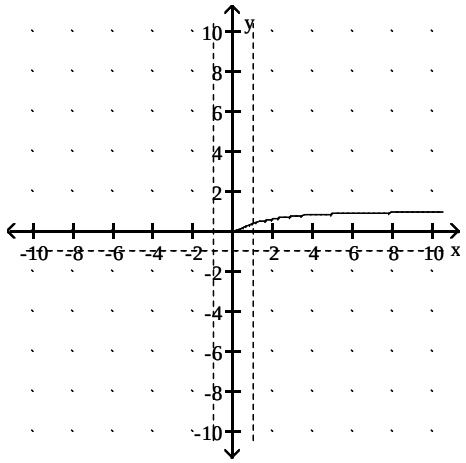
100) x–intercept: 0. y–intercept: 0.



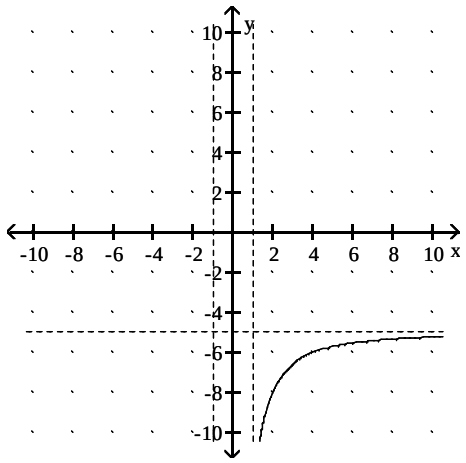
101) x–intercept: 0. y–intercept: 0



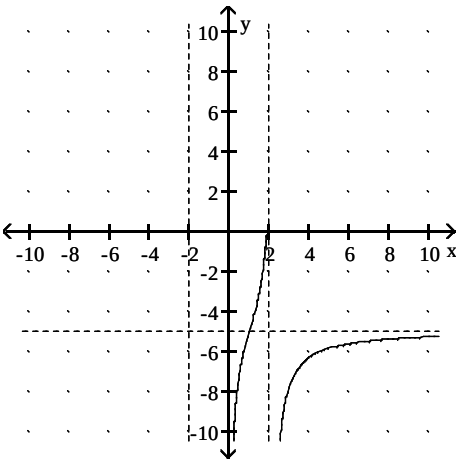
102) x–intercept: 0. y–intercept: 0



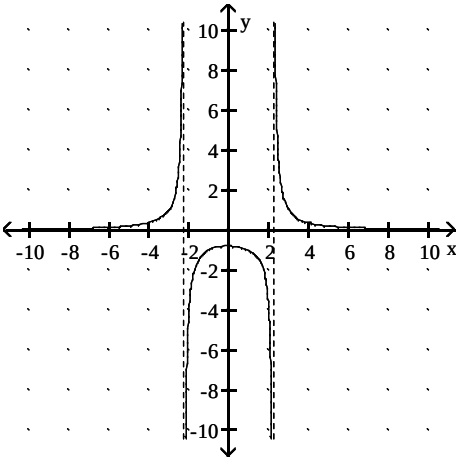
103) x–intercept: 0. y–intercept: 0.



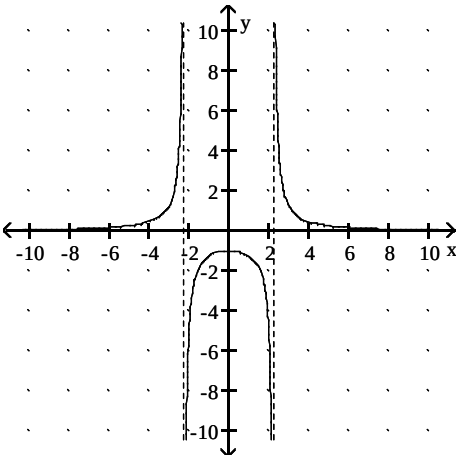
104) x–intercept: 0. y–intercept: 0.



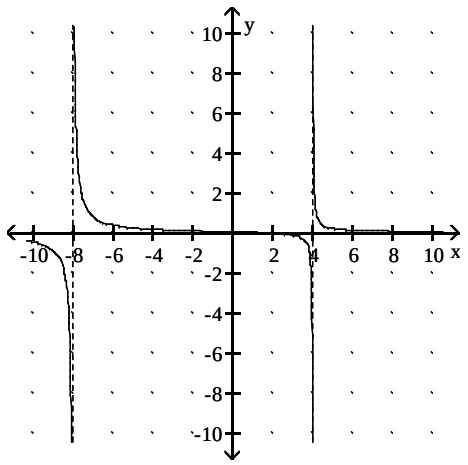
105) No x–intercept. y–intercept: $-\frac{4}{5}$



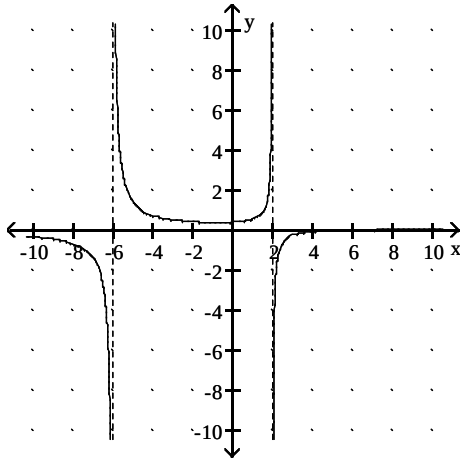
106) No x–intercept. y–intercept: – 1



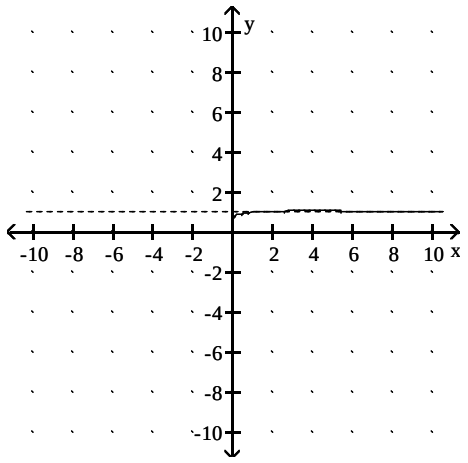
107) x–intercept: 2. y–intercept: $\frac{1}{16}$.



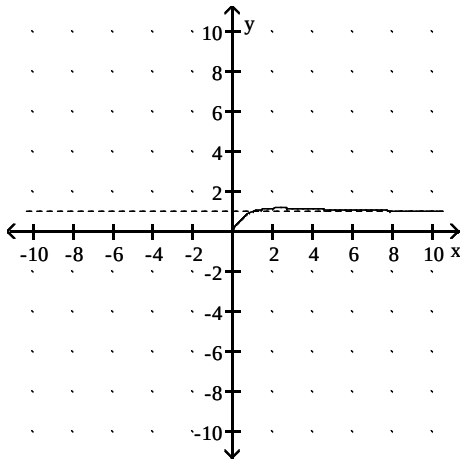
108) x–intercept: 5. y–intercept: $\frac{5}{12}$.



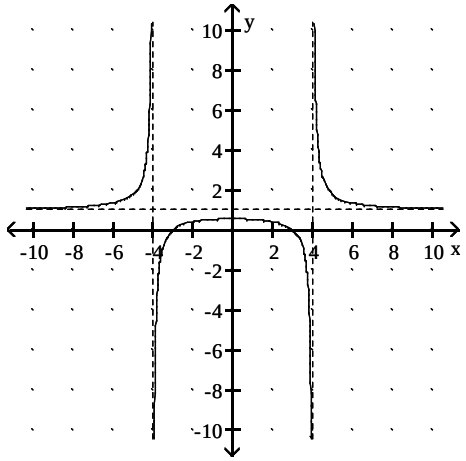
109) x–intercept: 0. y–intercept: 0.



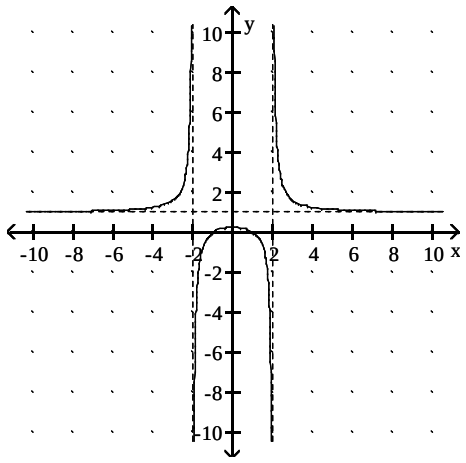
110) x–intercept: 0. y–intercept: 0.



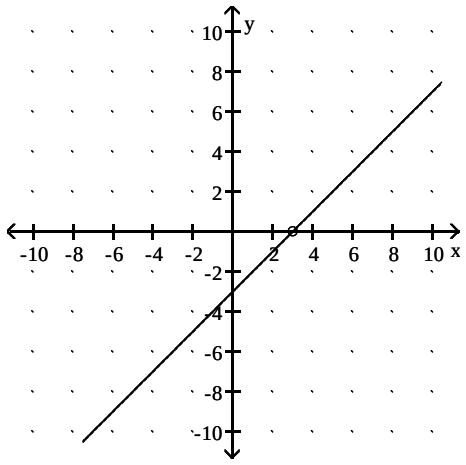
111) x–intercept: ±3. y–intercept: $\frac{9}{16}$.



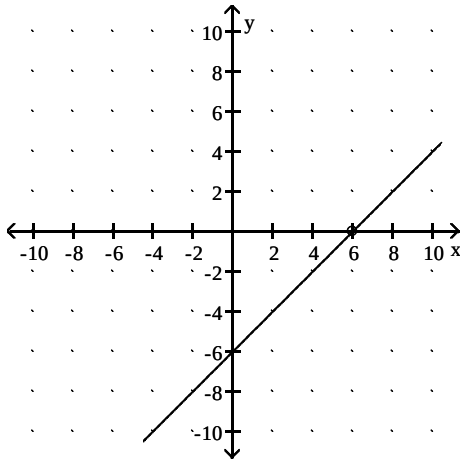
112) x–intercept: ±1. y–intercept: $\frac{1}{4}$.



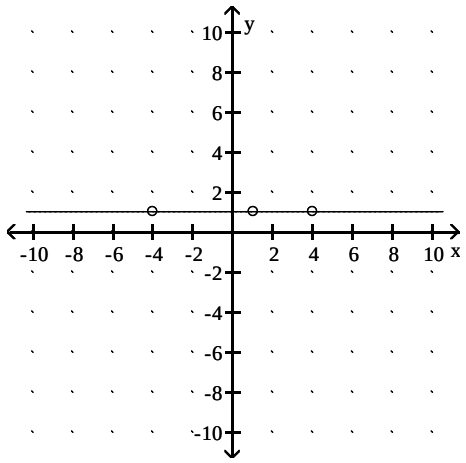
113) no x–intercept. y–intercept: –3



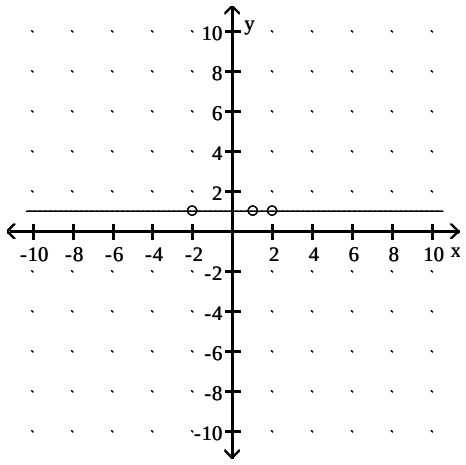
114) no x–intercept. y–intercept: –6



115) No x–intercept. y–intercept: 1.



116) No x–intercept. y–intercept: 1.



117) $(-\infty, -7) \cup (-1, \infty)$
118) $(-\infty, -7) \cup (-3, \infty)$
119) $(-2, 4)$
120) $(-1, 4)$
121) $(-\infty, -\sqrt{10}) \cup (0, \sqrt{10})$
122) $(-\infty, -\sqrt{5}) \cup (0, \sqrt{5})$
123) $[9, \infty)$
124) $[7, \infty)$
125) $[3, \infty)$
126) $(-8, 7)$
127) $(-2, 6)$
128) $(-3, \infty)$
129) $(-8, \infty)$
130) $(-7, \infty)$
131) $(-\infty, 4) \cup \left(\frac{16}{3}, \infty\right)$
132) $(-\infty, -7) \cup (4, \infty)$
133) $(-\infty, -9) \cup \left(-\frac{25}{3}, \infty\right)$
134) $(-\infty, -3) \cup \left(-\frac{3}{7}, \infty\right)$
135) $(-\infty, -2] \cup (0, 2]$
136) $(-\infty, -8] \cup (0, 8]$
137) $[-9, 1) \cup [5, \infty)$
138) $[-8, 1) \cup [5, \infty)$