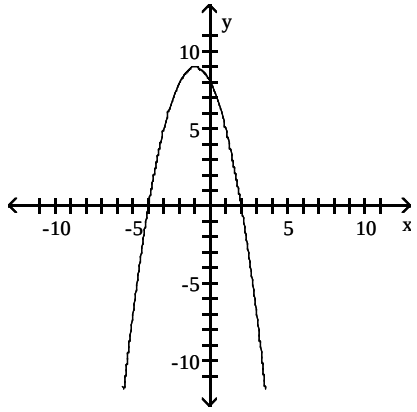
Math 141
Exam 3 Preparation Ch.3.1 to 3.8 v01
NO BOOK/ NO NOTES/YES CALCUATOR
Dressler Winter 2016

Name_____

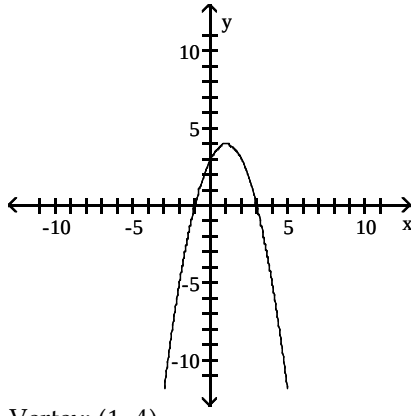
Determine the quadratic function whose graph is given by first writing in standard form.
Express your answer in both standard form and the form $ax^2 + bx + c$.

1) 1) _____



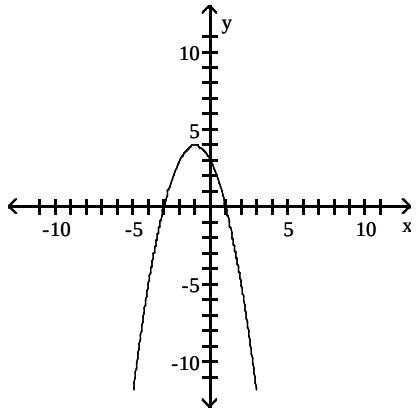
Vertex: (- 1, 9)
y–intercept: (0, 8)

2) 2) _____



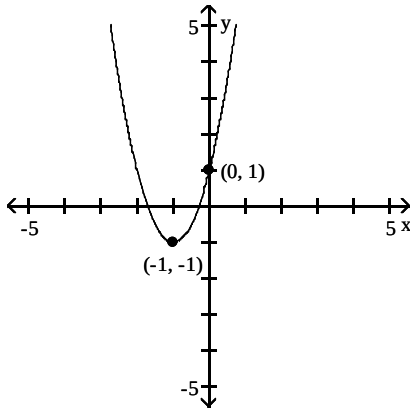
Vertex: (1, 4)
y–intercept: (0, 3)

3) 3) _____

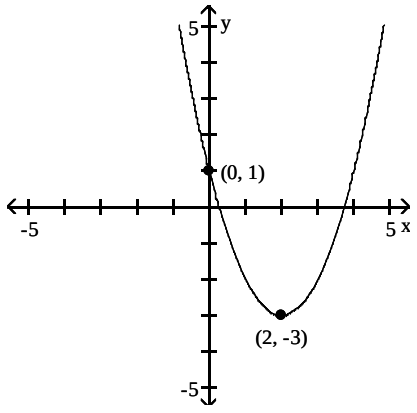


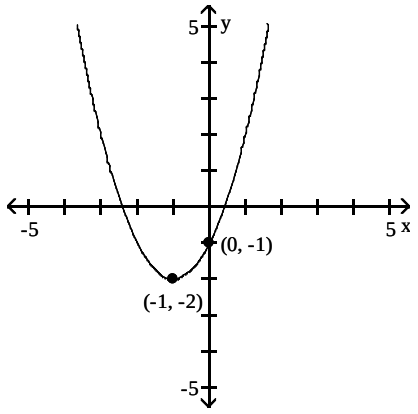
Vertex: (- 1, 4)
y–intercept: (0, 3)

4) 4) _____



5) 5) _____



6) 

6) _____

Solve the problem.

7) You have 104 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 80 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 84 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 96 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 $C(x) = 4x^2 - 32x + 144$. 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 $C(x) = 3x^2 - 12x + 32$. 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) $x^3 - 4$; $x - 1$ 13) _____

14) $3x^4 - 5x^2 - 1$; $x + \frac{1}{2}$ 14) _____

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

16) $x^5 - 3x^4 - 13x^3 + 17x^2 - 7x - 13$; $x - 5$ 16) _____

17) $x^5 - 3x^4 - 13x^3 + 18x^2 - 17x + 11$; $x - 5$ 17) _____

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

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

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

20) $x - 5$; $x^3 - 15x^2 + 71x - 105$ 20) _____

21) $x - 5$; $x^3 + 12x^2 + 23x - 36$ 21) _____

22) $x - 2$; $x^3 + 12x^2 + 27x - 40$ 22) _____

23) $x + 3$; $x^3 - 7x^2 - 9x + 63$ 23) _____

24) $x + 4$; $x^3 - 6x^2 - 19x + 84$ 24) _____

25) $x + 5$; $x^3 - 5x^2 - 29x + 105$ 25) _____

26) $x + 5$; $x^3 - 11x^2 + 12x + 80$ 26) _____

27) $x + 3$; $x^3 - 10x^2 + 10x + 72$ 27) _____

28) $x - 2$; $x^3 - 10x^2 + 31x - 30$ 28) _____

Find the set of possible rational zeros given the function.

29) $f(x) = 3x^3 + 55x^2 + 55x + 27$ 29) _____

30) $f(x) = 2x^3 + 5x^2 + 13x - 8$ 30) _____

31) $f(x) = 3x^3 + 64x^2 + 64x + 27$ 31) _____

32) $f(x) = 3x^3 + 57x^2 + 57x + 27$ 32) _____

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

34) $f(x) = 2x^3 - 5x^2 + 7x - 23$ 34) _____

35) $f(x) = 2x^3 - 5x^2 + 7x - 11$ 35) _____

36) $f(x) = 26x^7 + 104x^3 + 2x - 13$ 36) _____

37) $f(x) = 10x^7 + 40x^3 + 2x - 5$ 37) _____

Write the expression in the standard form a + bi.

38) i^{16} 38) _____

39) i^{12} 39) _____

40) i^{8} 40) _____

41) i^{7} 41) _____

42) i^{11} 42) _____

43) i^{5} 43) _____

44) i^{4} 44) _____

45) i^{13} 45) _____

46) i^{17} 46) _____

47) i^{21} 47) _____

48) i^{10} 48) _____

49) i^{14} 49) _____

50) i^{22} 50) _____

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

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

53) $(1 + i)^{7}$ 53) _____

54) $i^{14} + i^{12} + i^{10} + 1$ 54) _____

55) $i^{18} + i^{16} + i^{14} + 1$ 55) _____

Solve the problem.

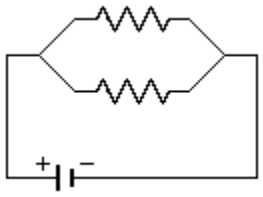
56) Ohm's law relates the current in a circuit, I, in amperes, the voltage of the circuit, V, in volts, and the impedance of the circuit, Z, in ohms, by the formula $Z = \frac{V}{I}$. Find V, the voltage of a circuit, if I = (5 + 6i) amperes and Z = (6 + 8i) ohms. 56) _____

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 = (16 + i) amperes and Z = (2 + 4i) 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 – 6i) volts and current is I = –10i 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 = (6 – 3i) ohms and voltage is V = 10i 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 = (8 – 5i) ohms and Z_2 = (–8 + 4i) ohms are in parallel. 60) _____



Parallel Circuit

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

61) $f(x) = x^4 - 32x^2 - 144$; zero: $-2i$ 61) _____

62) $f(x) = x^4 - 45x^2 - 196$; zero: $-2i$ 62) _____

63) $f(x) = x^3 + 2x^2 - 6x + 8$; zero: $1 + i$ 63) _____

64) $f(x) = x^3 + 7x^2 - 16x + 18$; 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) $f(x) = x^3 + 7x^2 + 19x + 13$; zero: $-3 + 2i$ 67) _____

68) $f(x) = x^3 + 5x^2 + 17x + 13$; zero: $-2 + 3i$ 68) _____

69) $f(x) = 2x^4 - 17x^3 + 59x^2 - 83x + 39$; zero: $3 + 2i$ 69) _____

70) $f(x) = 3x^4 - 25x^3 + 83x^2 - 103x + 26$; 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) $g(x) = \frac{x + 9}{x - 2}$ 73) _____

74) $g(x) = \frac{x + 6}{x - 3}$ 74) _____

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

76) $h(x) = \frac{x^2 - 100}{(x - 4)(x + 9)}$ 76) _____

77) $f(x) = \frac{x^2 + 5x}{x^2 - 2x - 35}$ 77) _____

78) $f(x) = \dfrac{x^2 + 3x}{x^2 - 2x - 15}$ 78) _____

79) $f(x) = \dfrac{x - 1}{x^2 + 2}$ 79) _____

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

80) $g(x) = \dfrac{x^2 + 8x - 2}{x - 2}$ 80) _____

81) $g(x) = \dfrac{x^2 + 9x - 2}{x - 2}$ 81) _____

82) $g(x) = \dfrac{x + 1}{x^2 - 9}$ 82) _____

83) $g(x) = \dfrac{x + 3}{x^2 - 9}$ 83) _____

84) $h(x) = \dfrac{-3x - 4}{4x - 5}$ 84) _____

85) $h(x) = \dfrac{-3x - 1}{5x + 7}$ 85) _____

86) $g(x) = \frac{4x^2 - 4x - 4}{8x^2 - 3x + 5}$ 86) _____

87) $g(x) = \frac{8x^2 - 6x - 3}{9x^2 - 3x + 7}$ 87) _____

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

89) $g(x) = \frac{3x^2 - 4x - 8}{7x^2 - 9x + 6}$ 89) _____

90) $g(x) = \frac{9x^2 - 8x - 9}{3x^2 - 7x + 6}$ 90) _____

91) $g(x) = \frac{x + 1}{x^2 - 7}$ 91) _____

92) $g(x) = \frac{x + 1}{x^2 - 8}$ 92) _____

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

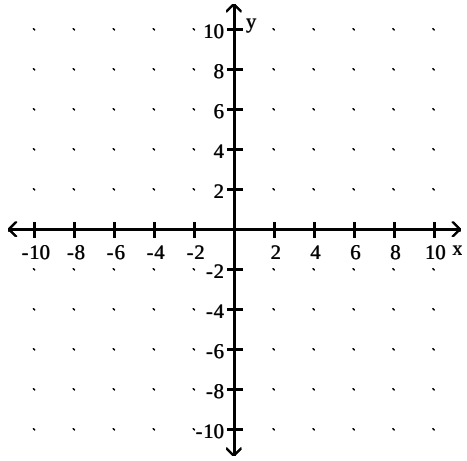
94) $h(x) = \dfrac{x^2 - 36}{x + 6}$ 94) _____

95) $f(x) = \dfrac{5x^2 + 9x - 5}{2x^3 - 3x + 8}$ 95) _____

96) $f(x) = \dfrac{3x^2 + 9x - 3}{5x^3 - 4x + 10}$ 96) _____

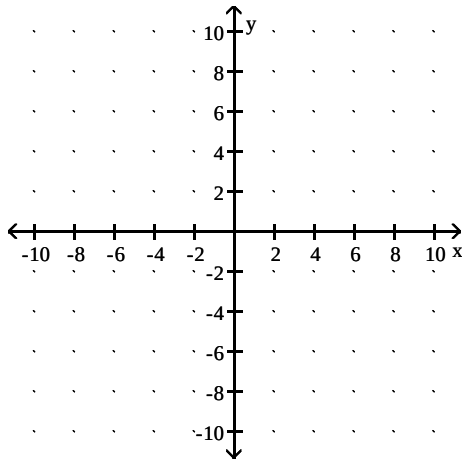
Graph the rational function and find the intercepts.

97) $f(x) = \dfrac{3x}{x - 1}$ 97) _____



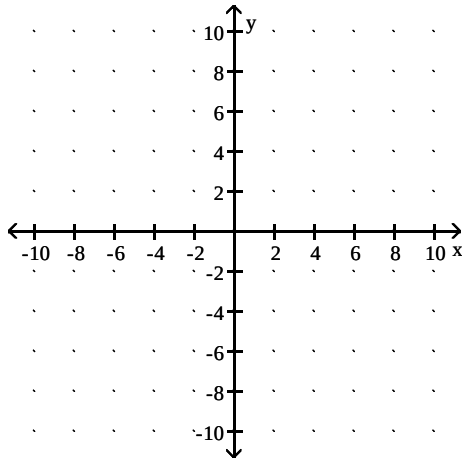
98) $f(x) = \frac{2x}{x - 2}$

98) _____

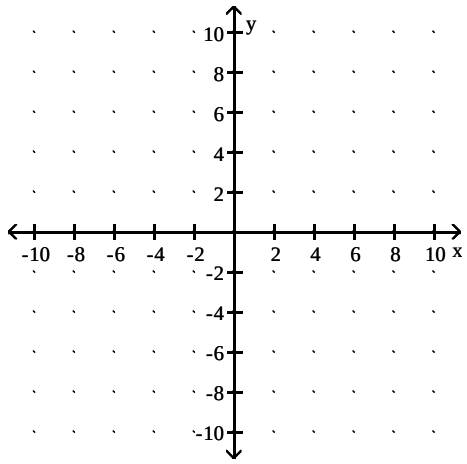


99) $f(x) = \frac{x}{x^2 - 16}$

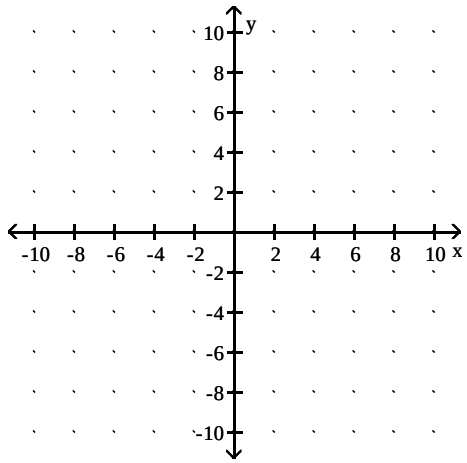
99) _____



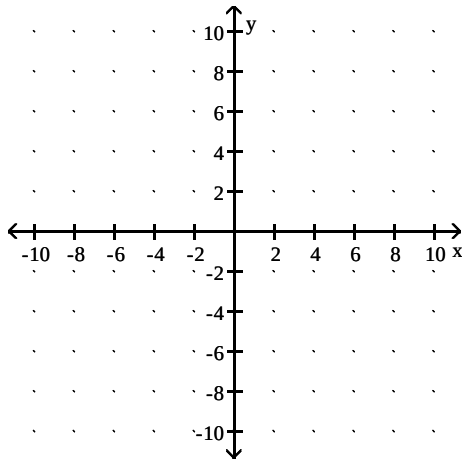
100) $f(x) = \dfrac{x}{x^2 - 9}$ 100) _____



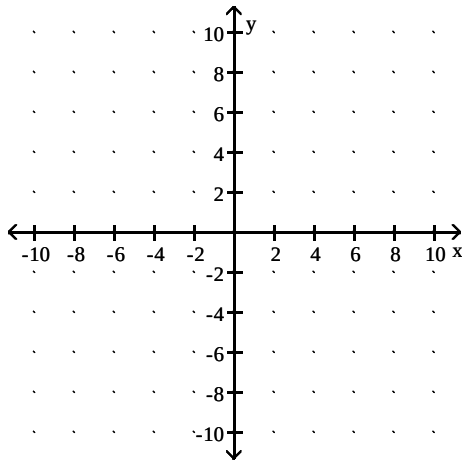
101) $g(x) = \dfrac{x^2}{1 - x^2}$ 101) _____



102) $g(x) = \dfrac{x^2}{25 - x^2}$ 102) _____

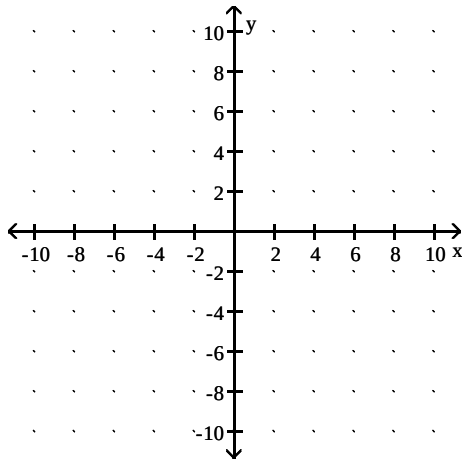


103) $h(x) = \dfrac{-5x^2}{x^2 - 4}$ 103) _____



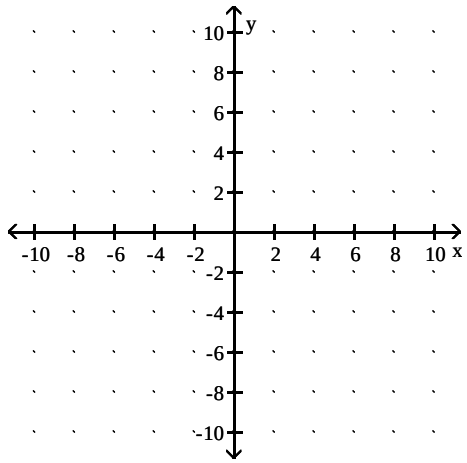
104) $h(x) = \dfrac{-3x^2}{x^2 - 1}$

104) _____

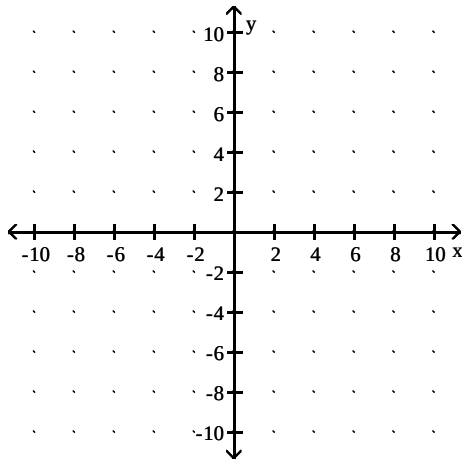


105) $f(x) = \dfrac{4}{x^2 - 7}$

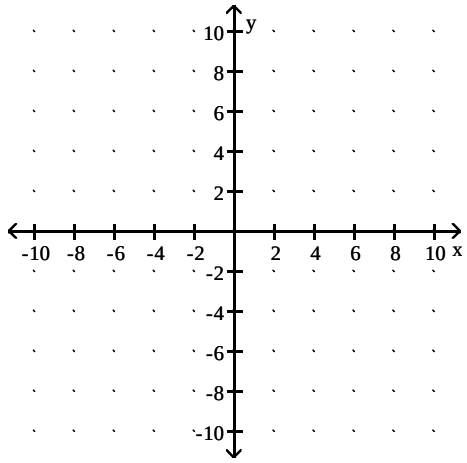
105) _____



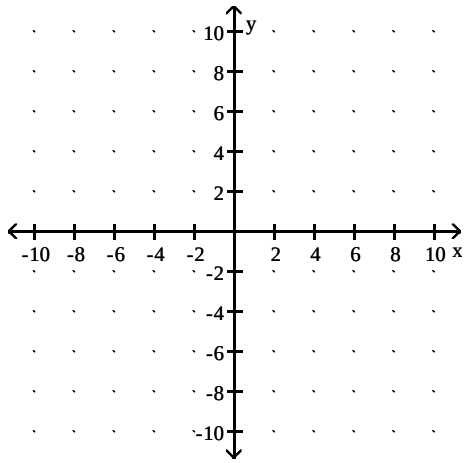
106) $f(x) = \dfrac{3}{x^2 - 5}$ 106) _____



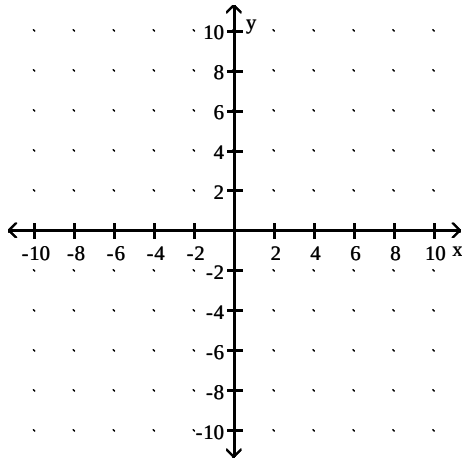
107) $g(x) = \dfrac{x - 4}{(x - 1)(x + 6)}$ 107) _____



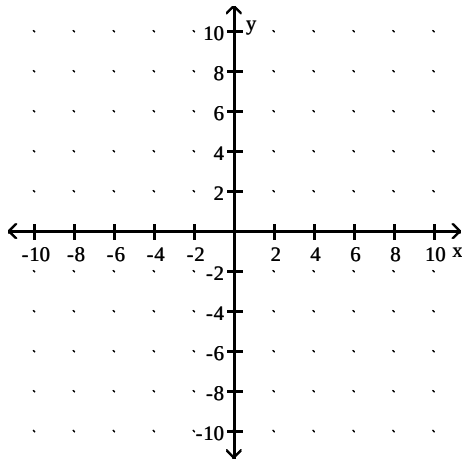
108) $g(x) = \dfrac{x - 2}{(x - 4)(x + 7)}$ 108) _____



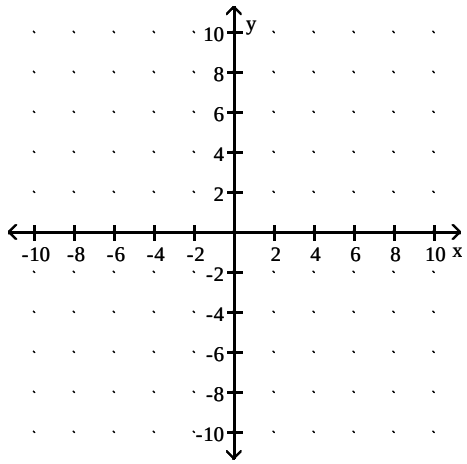
109) $h(x) = \dfrac{x^2}{x^2 + 9}$ 109) _____



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

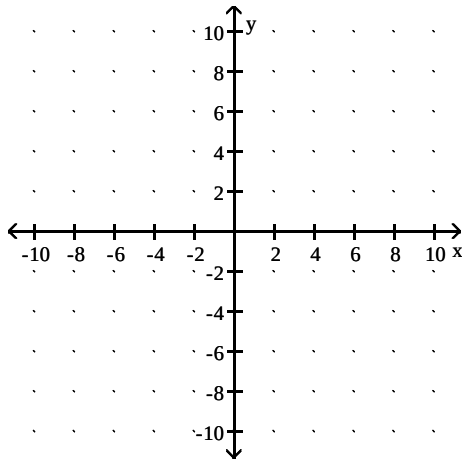


111) $f(x) = \dfrac{x^2 - 16}{x^2 - 25}$ 111) _____



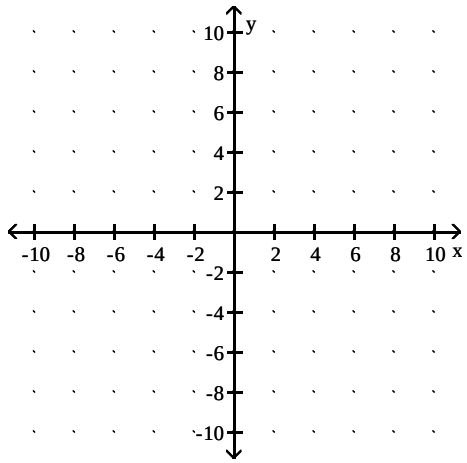
112) $f(x) = \dfrac{x^2 - 16}{x^2 - 1}$

112) _____

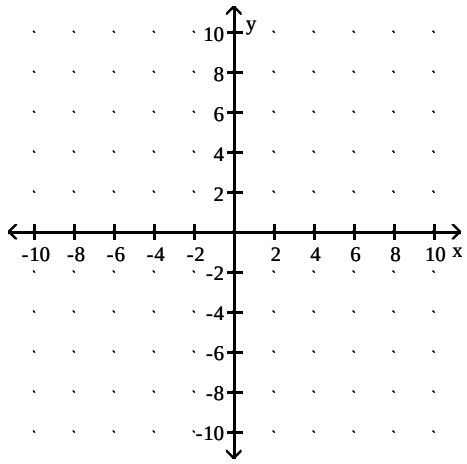


113) $g(x) = \dfrac{(x - 4)^2}{x - 4}$

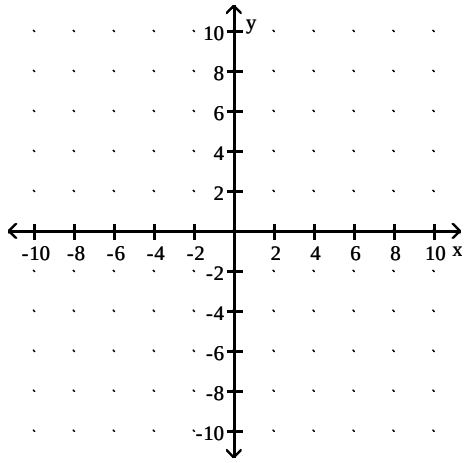
113) _____



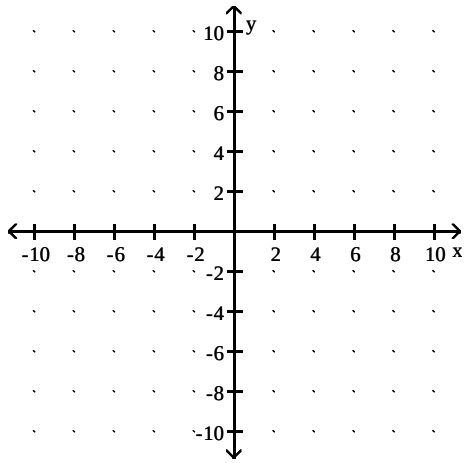
114) $g(x) = \dfrac{(x-5)^2}{x-5}$ 114) _____



115) $h(x) = \dfrac{(x-4)(x+4)(x-2)}{(x-4)(x+4)(x-2)}$ 115) _____



116) $h(x) = \dfrac{(x-3)(x+3)(x-1)}{(x-3)(x+3)(x-1)}$ 116) _____



Solve the inequality. Write the solution in interval notation.

117) $x^2 + 8x + 15 > 0$ 117) _____

118) $x^2 - 9x + 14 > 0$ 118) _____

119) $x^2 - 2x - 15 < 0$ 119) _____

120) $x^2 - 4x - 21 < 0$ 120) _____

121) $6x^5 < 60x^3$ 121) _____

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

123) $x^3 \geq 8x^2$ 123) _____

124) $x^3 \geq 5x^2$ 124) _____

125) $x^3 \geq 8$ 125) _____

126) $\frac{x-3}{x+9} < 0$ 126) _____

127) $\frac{x-1}{x+7} < 0$ 127) _____

128) $\frac{x-8}{x+2} < 1$ 128) _____

129) $\frac{x-9}{x+2} < 1$ 129) _____

130) $\frac{x-9}{x+7} < 1$ 130) _____

131) $\frac{x}{x-6} < 3$ 131) _____

132) $\frac{x-1}{x+8} > 0$ 132) _____

133) $\frac{x+17}{x+7} < 5$ 133) _____

134) $\frac{x+13}{x+8} < 3$ 134) _____

135) $\frac{(x-7)(x+7)}{x} \leq 0$ 135) _____

136) $\frac{(x-4)(x+4)}{x} \leq 0$ 136) _____

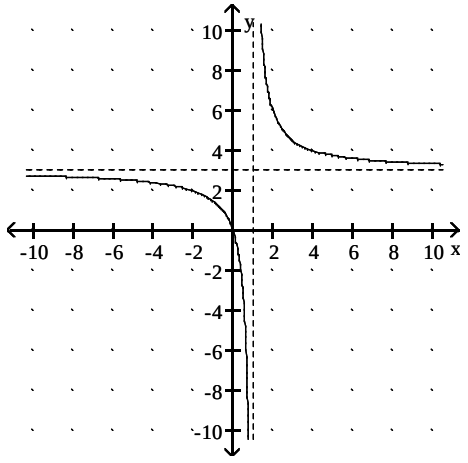
137) $\frac{(x+8)(x-6)}{x-1} \geq 0$ 137) _____

138) $\frac{(x+5)(x-2)}{x-1} \geq 0$ 138) _____

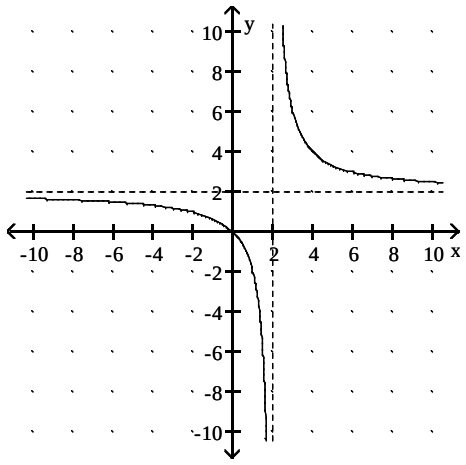
1) $f(x) = -x^2 - 2x + 8$
2) $f(x) = -x^2 + 2x + 3$
3) $f(x) = -x^2 - 2x + 3$
4) $f(x) = 2x^2 + 4x + 1$
5) $f(x) = x^2 - 4x + 1$
6) $f(x) = x^2 + 2x - 1$
7) length: 52 ft, width: 26 ft
8) length: 40 ft, width: 20 ft
9) length: 42 ft, width: 21 ft
10) length: 48 ft, width: 24 ft
11) 4 thousand automobiles
12) 2 thousand automobiles
13) quotient: $x^2 + x + 1$; remainder: -3
14) quotient: $3x^3 - \frac{3}{2}x^2 - \frac{17}{4}x + \frac{17}{8}$; remainder: $-\frac{33}{16}$
15) quotient: $2x^3 + \frac{2}{3}x^2 + \frac{20}{9}x + \frac{20}{27}$; remainder: $-\frac{61}{81}$
16) quotient: $x^4 + 2x^3 - 3x^2 + 2x + 3$; remainder: 2
17) quotient: $x^4 + 2x^3 - 3x^2 + 3x - 2$; remainder: 1
18) quotient: $3x^3 + \frac{3}{2}x^2 + \frac{15}{4}x + \frac{15}{8}$; remainder: $-\frac{1}{16}$
19) quotient: $2x^3 - \frac{1}{2}x^2 - \frac{23}{8}x + \frac{23}{32}$; remainder: $-\frac{151}{128}$
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) $\left\{\pm 1, \pm 7, \pm\frac{1}{2}, \pm\frac{7}{2}\right\}$
34) $\left\{\pm 1, \pm 23, \pm\frac{1}{2}, \pm\frac{23}{2}\right\}$
35) $\left\{\pm 1, \pm 11, \pm\frac{1}{2}, \pm\frac{11}{2}\right\}$

36) $\left\{\pm 1, \pm\frac{1}{2}, \pm 13, \pm\frac{13}{2}, \pm\frac{1}{13}, \pm\frac{1}{26}\right\}$
37) $\left\{\pm 1, \pm\frac{1}{2}, \pm 5, \pm\frac{5}{2}, \pm\frac{1}{5}, \pm\frac{1}{10}\right\}$
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) 8 - 8i
54) 0
55) 0
56) (–18 + 76i) volts
57) (28 + 66i) volts
58) $\left(\frac{3}{5} + \frac{3}{10}i\right)$ ohms
59) $\left(-\frac{2}{3} + \frac{4}{3}i\right)$ amperes
60) $\left(-72 - 44i\right)$ ohms
61) 2i, 6, –6
62) 2i, 7, –7
63) 1 – i, –4
64) 1 – i, –9
65) 3 + 2i, 3 – 2i
66) 3 + 2i, 3 – 2i
67) –3 – 2i, –1
68) –2 – 3i, –1
69) 3 – 2i, 1, $\frac{3}{2}$
70) 3 – 2i, 2, $\frac{1}{3}$
71) –2, –3i, –4 – i, –4 + i
72) –2, –3i, –4 – i, –4 + i
73) x = 2
74) x = 3
75) x = 2, x = –6
76) x = 4, x = –9
77) x = 7
78) x = 5

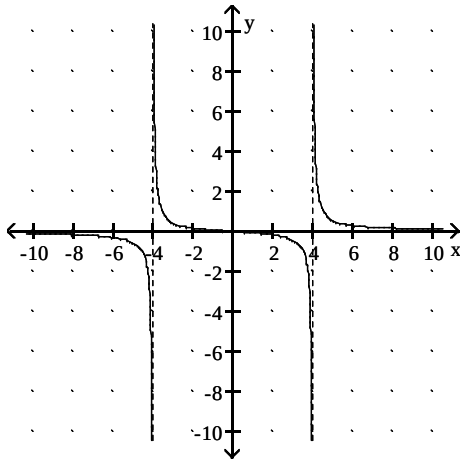
79) no vertical asymptote
80) no horizontal asymptote
81) no horizontal asymptote
82) y = 0
83) y = 0
84) $y = -\frac{3}{4}$
85) $y = -\frac{3}{5}$
86) $y = \frac{1}{2}$
87) $y = \frac{8}{9}$
88) $y = \frac{9}{2}$
89) $y = \frac{3}{7}$
90) y = 3
91) y = 0
92) y = 0
93) no horizontal asymptote
94) no horizontal asymptote
95) y = 0
96) y = 0
97) x intercept: 0. y–intercept: 0.



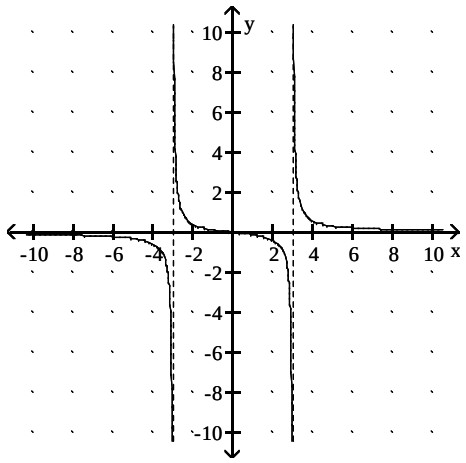
98) x intercept: 0. y–intercept: 0.



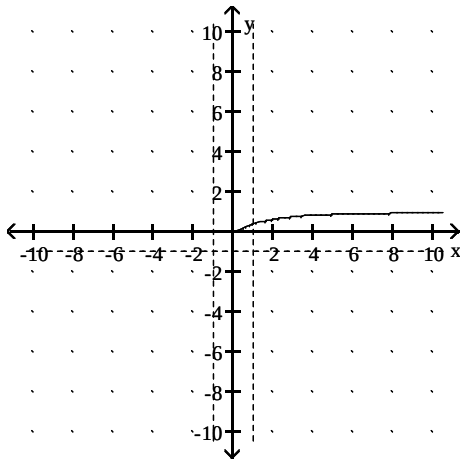
99) x–intercept: 0. y–intercept: 0.



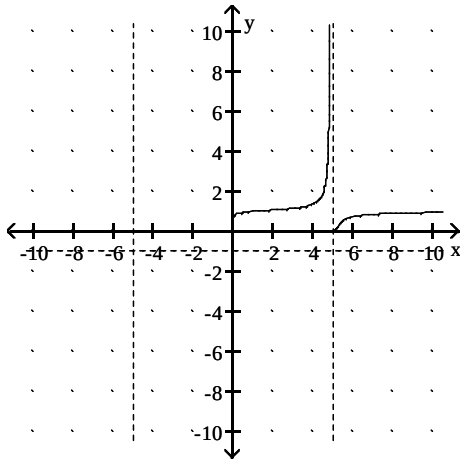
100) x–intercept: 0. y–intercept: 0.



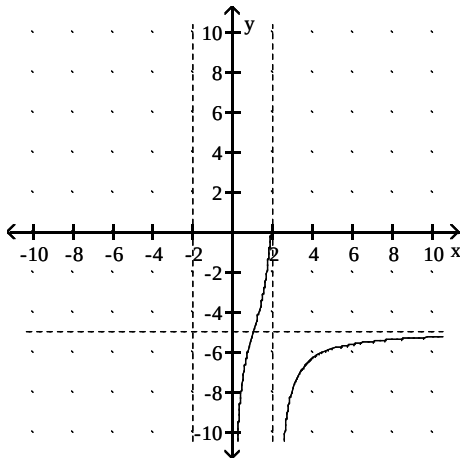
101) x–intercept: 0. y–intercept: 0



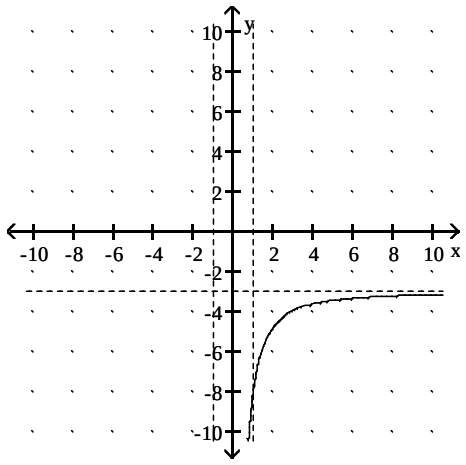
102) x–intercept: 0. y–intercept: 0



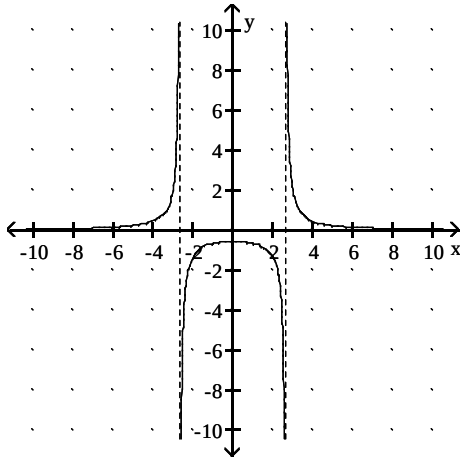
103) x–intercept: 0. y–intercept: 0.



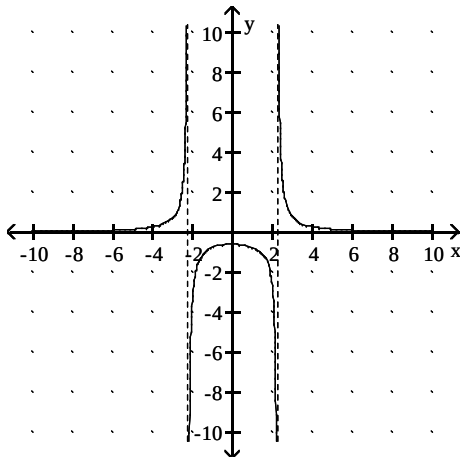
104) x–intercept: 0. y–intercept: 0.



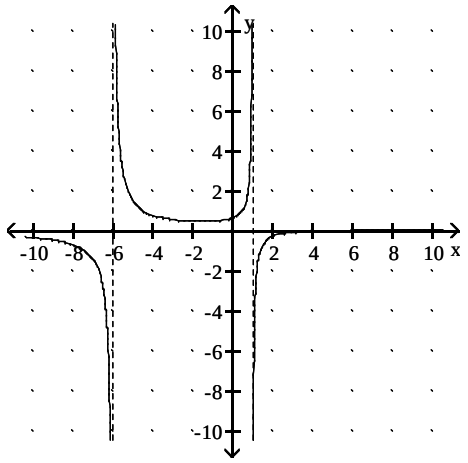
105) No x–intercept. y–intercept: $-\frac{4}{7}$



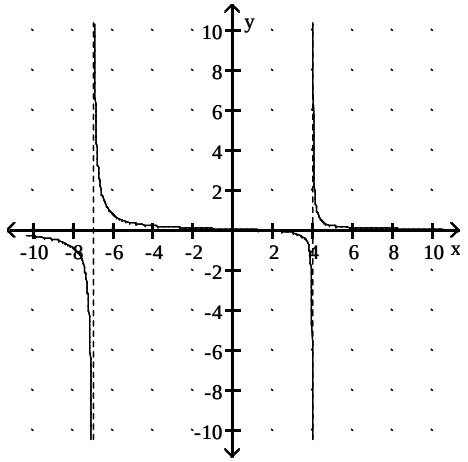
106) No x–intercept. y–intercept: $-\frac{3}{5}$



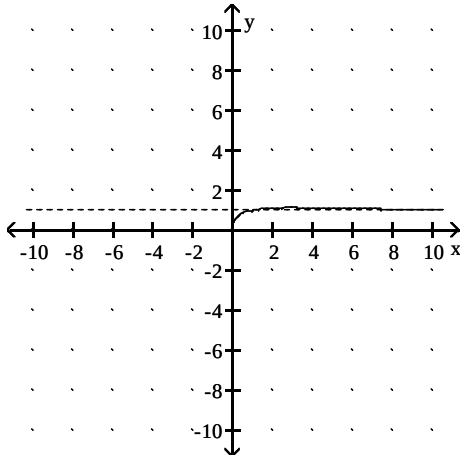
107) x–intercept: 4. y–intercept: $\frac{2}{3}$.



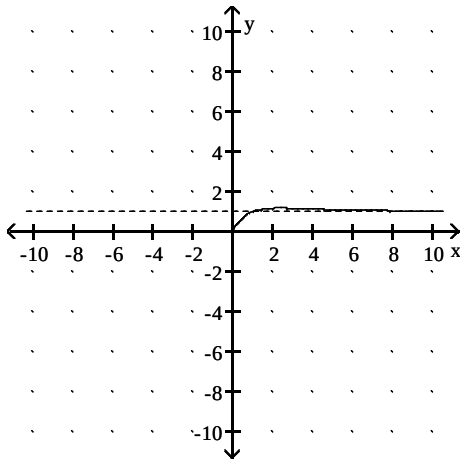
108) x–intercept: 2. y–intercept: $\frac{1}{14}$.



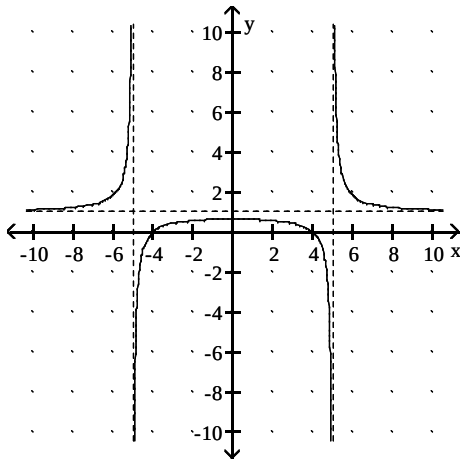
109) x–intercept: 0. y–intercept: 0.



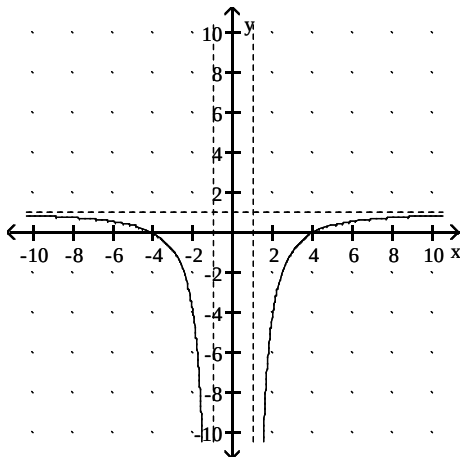
110) x–intercept: 0. y–intercept: 0.



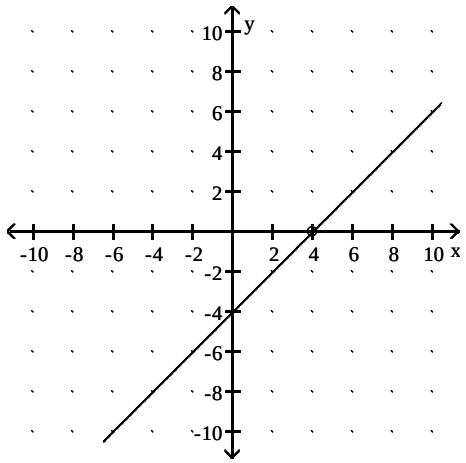
111) x–intercept: ±4. y–intercept: $\frac{16}{25}$.



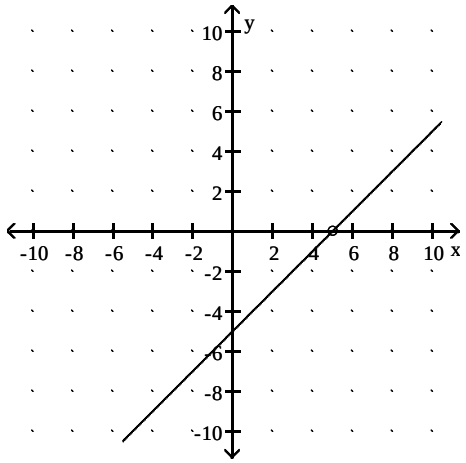
112) x–intercept: ±4. y–intercept: 16.



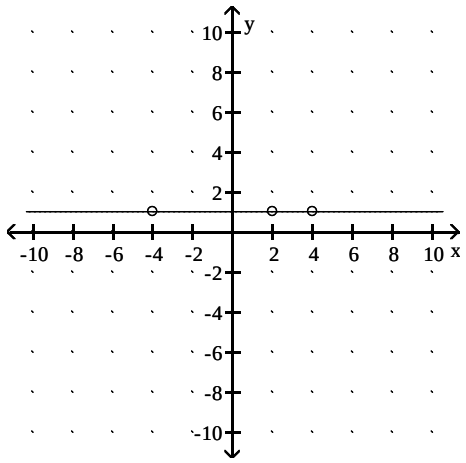
113) no x–intercept. y–intercept: –4



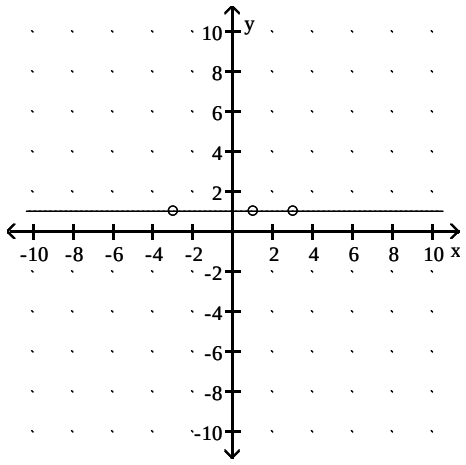
114) no x–intercept. y–intercept: –5



115) No x–intercept. y–intercept: 1.



116) No x–intercept. y–intercept: 1.



117) $(-\infty, -5) \cup (-3, \infty)$
118) $(-\infty, 2) \cup (7, \infty)$
119) $(-3, 5)$
120) $(-3, 7)$
121) $(-\infty, -\sqrt{10}) \cup (0, \sqrt{10})$
122) $(-\infty, -\sqrt{3}) \cup (0, \sqrt{3})$
123) $[8, \infty)$
124) $[5, \infty)$
125) $[2, \infty)$
126) $(-9, 3)$
127) $(-7, 1)$
128) $(-2, \infty)$
129) $(-2, \infty)$
130) $(-7, \infty)$
131) $(-\infty, 6) \cup \left(9, \infty\right)$
132) $(-\infty, -8) \cup (1, \infty)$
133) $(-\infty, -7) \cup \left(-\frac{9}{2}, \infty\right)$
134) $(-\infty, -8) \cup \left(-\frac{11}{2}, \infty\right)$
135) $(-\infty, -7] \cup (0, 7]$
136) $(-\infty, -4] \cup (0, 4]$
137) $[-8, 1) \cup [6, \infty)$
138) $[-5, 1) \cup [2, \infty)$