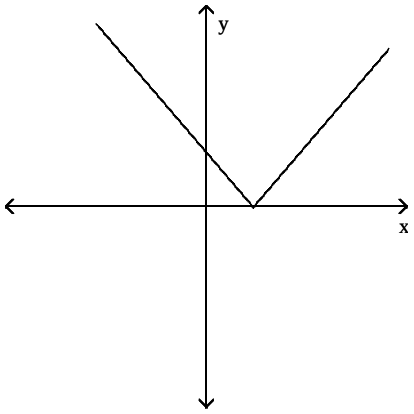
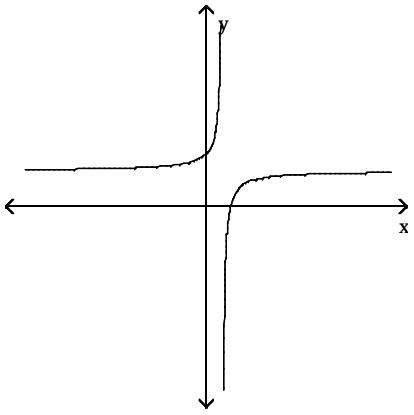
Chapter # 5 Practice Section:_____, Date:_____Name_____

Determine whether the graph shown is the graph of a polynomial function.

1) 

1) _____

2) 

2) _____

For those which are polynomial functions, find the degree, the leading term, and the leading coefficient.

3) $f(x) = \begin{cases} x - 4, & x \neq 4 \\ 4, & x = 4 \end{cases}$ 3) _____

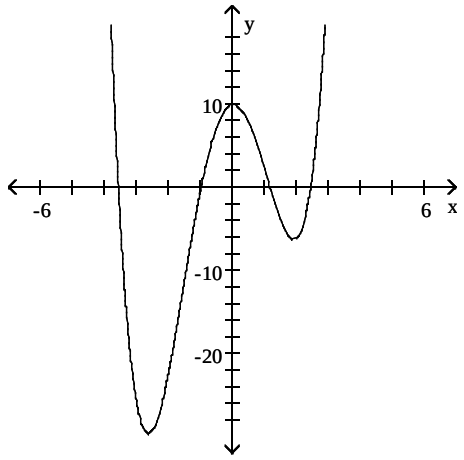
4) $f(x) = 3x^6 + 6x^2$ 4) _____

5) $f(x) = 3x^{-4} + 5x - 7x^5$ 5) _____

6) $f(x) = 8x^4 - 2\sqrt[3]{x}$ 6) _____

Find the equation that the given graph represents.

7) 7) _____



A) $f(x) = -x^3 - 12x^2 + 3x + 10$

B) $f(x) = x^4 + x^3 - 10x^2 + 10$

C) $f(x) = x^3 - 10x^2 - x + 10$

D) $f(x) = -x^4 + x^3 - 12x^2 + 10$

Find the zeros of the polynomial function and state the multiplicity of each.

8) $f(x) = 4(x + 9)^2(x - 9)^3$ 8) _____

9) $f(x) = -4x^2(x - 6)(x + 1)^3$ 9) _____

10) $f(x) = 4x(x - 5)(x + 12)\left(x - \frac{1}{2}\right)$ 10) _____

11) $f(x) = (x^2 - 4)^3$ 11) _____

12) $f(x) = (x^2 + 13x + 40)^2$ 12) _____

Find the zeros of the polynomial function. State whether the graph crosses the x–axis, or touches the x–axis and turns around, at each intercept.

13) $f(x) = 6x^2 - x^3$ 13) _____

14) $f(x) = x^4 - 25x^2$ 14) _____

15) $x^4 + 6x^3 - 16x^2 = 0$ 15) _____

16) $f(x) = (x + 1)(x - 4)(x - 1)^2$ 16) _____

Use the Leading Coefficient Test to determine the end behavior of the polynomial function.

17) $f(x) = 5x^3 + 4x^3 - x^5$ 17) _____

18) $f(x) = x + 5x^2 - 3x^3$ 18) _____

19) $f(x) = (x + 1)(x + 2)(x + 3)^2$ 19) _____

20) $f(x) = -5(x^2 + 3)(x + 4)^2$ 20) _____

21) $f(x) = -x^2(x - 4)(x - 1)$ 21) _____

Determine the maximum possible number of turning points for the graph of the function.

22) $f(x) = 5x^3 + 4x^2 + -7x - 7$ 22) _____

23) $f(x) = x^7 + 9x^8$ 23) _____

24) $g(x) = - 2x + 4$ 24) _____

25) $f(x) = (x + 5)(x + 2)(7x + 2)$ 25) _____

26) $f(x) = x^5(x^5 + 3)(4x + 5)$ 26) _____

Find the y–intercept of the polynomial function.

27) $f(x) = 8x - x^3$ 27) _____

28) $f(x) = (x + 1)(x - 5)(x - 1)^2$ 28) _____

29) $f(x) = -x^2(x + 2)(x^2 + 1)$ 29) _____

30) $f(x) = x^2(x - 2)(x - 6)$ 30) _____

Graph the function.

31) $f(x) = 2x(x - 2)(x - 1)$ 31) _____

32) $f(x) = x(x + 4)(x - 3)(x + 3)$ 32) _____

33) $P(x) = 2x(x + 1)^2$ 33) _____

34) $f(x) = (x + 1)^2(x^2 - 25)$ 34) _____

35) $f(x) = -2x^3(x + 1)^2(x + 2)$ 35) _____

Solve the problem.

36) The polynomial $G(x) = -0.006x^4 + 0.140x^3 - 0.53x^2 + 1.79x$ measures the concentration of a dye in the bloodstream x seconds after it is injected. Does the concentration increase between 12 and 13 seconds? 36) _____

37) A rectangular piece of cardboard measuring 12 inches by 35 inches is to be made into a box with an open top by cutting equal size squares from each corner and folding up the sides. Let x represent the length of a side of each such square. For what value of x will the volume be a maximum? If necessary, round to 2 decimal places. 37) _____

38) A rectangular piece of cardboard measuring 13 inches by 39 inches is to be made into a box with an open top by cutting equal size squares from each corner and folding up the sides. Let x represent the length of a side of each such square. What is the maximum volume of this box? If necessary, round to 2 decimal places. 38) _____

39) $S(x) = -x^3 + 6x^2 + 288x + 4000$, $4 \le x \le 20$ is an approximation to the number of salmon swimming upstream to spawn, where x represents the water temperature in degrees Celsius. Find the temperature that produces the maximum number of salmon. 39) _____

Use long division to find the quotient and the remainder

40) $\dfrac{x^2 + 2x - 35}{x + 7}$ 40) _____

41) $\dfrac{4x^3 - 20x^2 + 17x + 39}{2x - 5}$ 41) _____

42) $\dfrac{x^4 + 5x^3 - 4x^2 - 23x + 45}{x^2 + 4x - 3}$ 42) _____

43) $\dfrac{x^3 + 64}{x + 4}$ 43) _____

Use synthetic division to find the quotient and the remainder.

44) $\dfrac{x^3 - 5}{x - 1}$ 44) _____

45) $\dfrac{x^5 - 3x^4 - 12x^3 + 12x^2 - 7x - 12}{x - 5}$ 45) _____

46) $\dfrac{6x^5 - 5x^4 + x - 4}{x + \frac{1}{2}}$ 46) _____

47) $\dfrac{2x^4 - x^3 - 15x^2 + 3x}{x + 3}$ 47) _____

Use synthetic division to find the function value.

48) $f(x) = x^3 - 4x^2 + 2x + 1$; find $f(2)$ 48) _____

49) $f(x) = 3x^3 - 2x^2 - 7x + 13$; find $f(2)$ 49) _____

50) $f(x) = 6x^3 - 23x^2 - 11x$; find $f\left(-\frac{1}{2}\right)$ 50) _____

Use the factor theorem to show that the linear polynomial is a factor of the second polynomial.

51) $x - 5; x^3 - 16x^2 + 79x - 120$ 51) _____

52) $x - 5; x^3 + 10x^2 + 19x - 30$ 52) _____

53) $x + 5; x^3 - 4x^2 - 31x + 70$ 53) _____

54) $x + 5; x^3 - 12x^2 + 20x + 100$ 54) _____

55) $x + 6; 3x^3 - 18x^2 - 12x + 72$ 55) _____

Give all possible rational zeros for the polynomial.

56) $f(x) = x^3 - 10x^2 + 7x - 24$ 56) _____

57) $f(x) = 2x^3 + 5x^2 + 13x - 8$ 57) _____

58) $f(x) = 3x^3 + 62x^2 + 62x + 27$ 58) _____

59) $f(x) = 2x^3 - 5x^2 + 7x - 19$ 59) _____

Find all rational zeros.

60) $f(x) = x^3 + 6x^2 - 40x - 192$ 60) _____

61) $f(x) = x^3 - 7x^2 + 7x + 15$ 61) _____

62) $f(x) = 4x^3 - 28x^2 - x + 7$ 62) _____

63) $f(x) = 12x^3 + 49x^2 + 3x - 4$ 63) _____

Solve the problem.

64) The Cool Company determines that the supply function for its basic air conditioning unit is $S(p) = 40 + 0.008p^3$ and that its demand function is $D(p) = 200 - 0.16p^2$, where p is the price. Determine the price for which the supply equals the demand. 64) _____

Find all solutions of the equation in the complex number system.

65) $x^2 + 49 = 0$ 65) _____

66) $(x + 16)^2 = -6$ 66) _____

67) $x^4 - 16 = 0$ 67) _____

68) $x^2 - 6x + 9 = -25$ 68) _____

Find the remaining zeros of a polynomial with real coefficients and having the specified degree and zeros.

69) Degree 3; zeros: 1, 4 – i 69) _____

70) Degree 4; zeros: i, 3 + i 70) _____

71) Degree 4; zeros: 4 – 5i, 9i 71) _____

72) Degree 3; zeros: –5, 5 – 5i 72) _____

Find the polynomial P(x) with real coefficients having the specific degree, leading coefficient, and zeros.

73) degree: 3, leading coefficient: –4, zeros: 5, 5 + 4i 73) _____

74) degree: 6, leading coefficient: 2, zeros: 5, 0 (multiplicity 3), 4 – 2i 74) _____

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

75) $f(x) = x^4 - 5x^2 - 36$; zero: –2i 75) _____

76) $f(x) = x^3 + 2x^2 - 6x + 8$; zero: 1 + i 76) _____

77) $f(x) = x^3 - 3x^2 - 5x + 39$; zero: –3 77) _____

Find all the zeros of the polynomial function.

78) $f(x) = x^3 - 6x^2 + x - 6$ 78) _____

79) $P(x) = 4x^3 - 9x^2 + 42x - 10$ 79) _____

80) $f(x) = 3x^4 - 15x^3 + 30x^2 - 60x + 72$ 80) _____

Graph the function.

81) $f(x) = \frac{7}{x}$ 81) _____

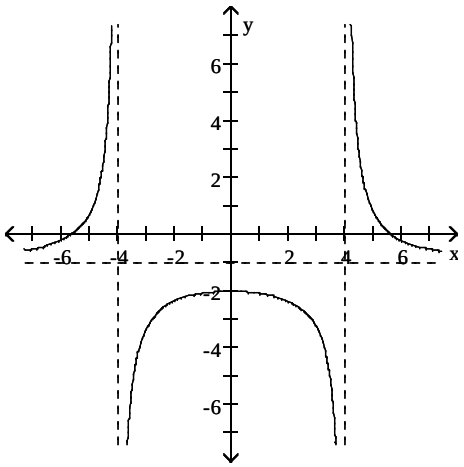
82) $f(x) = -\dfrac{1}{x - 3}$ 82) _____

83) $f(x) = \dfrac{1}{x} + 3$ 83) _____

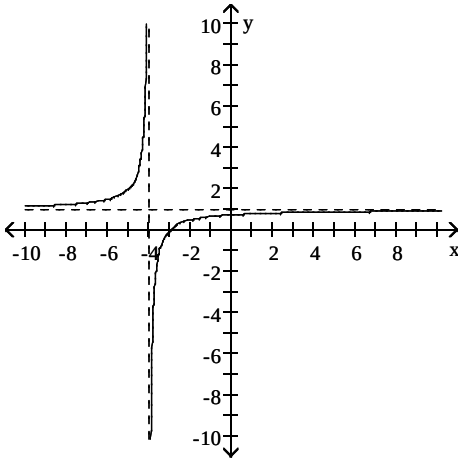
84) $f(x) = \dfrac{-4}{(x - 4)^2}$ 84) _____

Use the graph to answer the question.

85) Find the horizontal and vertical asymptotes of the rational function graphed below. 85) _____



86) Find the domain and range of the rational function graphed below. 86) _____



Find any vertical asymptotes.

87) $h(x) = \dfrac{5}{x - 1}$ 87) _____

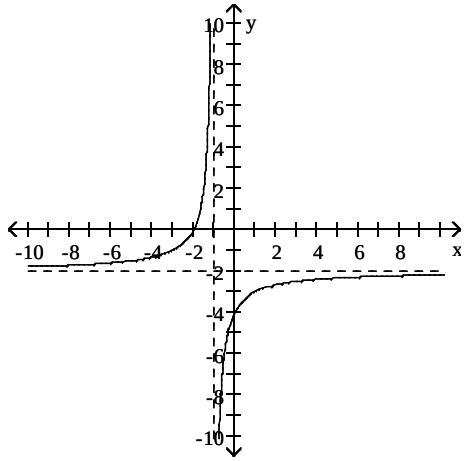
88) $f(x) = \dfrac{x - 1}{x^2 + 3}$ 88) _____

89) $h(x) = \dfrac{(x - 9)(x + 4)}{x^2 - 9}$ 89) _____

90) $f(x) = \dfrac{x - 6}{x^2 + 3x}$ 90) _____

Use the graph to answer the question.

91) Find the horizontal and vertical asymptotes of the rational function graphed below. 91) _____



Find the horizontal asymptote of the given function.

92) $f(x) = \dfrac{4x^2 + 7}{4x^2 - 7}$ 92) _____

93) $g(x) = \dfrac{x^2 + 8x - 5}{x - 5}$ 93) _____

94) $g(x) = \dfrac{x + 9}{x^2 - 6}$ 94) _____

95) $h(x) = \dfrac{16x^2}{8x^2 - 3}$ 95) _____

96) $h(x) = \dfrac{9x^2 - 6x - 2}{8x^2 - 7x + 3}$ 96) _____

Give the equation of the oblique asymptote, if any.

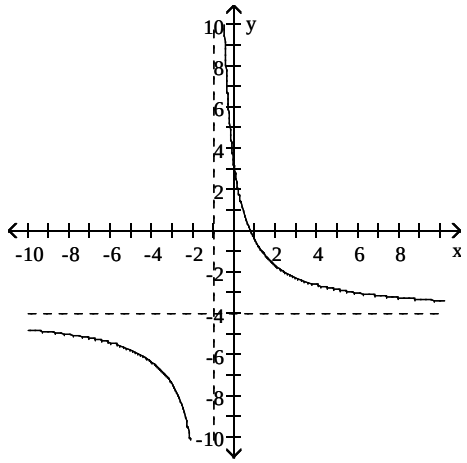
97) $h(x) = \dfrac{5}{x - 7}$ 97) _____

98) $f(x) = \dfrac{x^2 + 2x - 3}{x - 4}$ 98) _____

99) $f(x) = \dfrac{x^2 - 9x + 3}{x + 9}$ 99) _____

Identify any vertical, horizontal, or oblique asymptotes in the graph of y = f(x). State the domain of f.

100) 100) _____



Sketch the graph of the rational function.

101) $f(x) = \dfrac{x - 2}{x + 3}$ 101) _____

102) $f(x) = \dfrac{4x}{(x + 4)(x + 2)}$ 102) _____

103) $f(x) = \dfrac{x^2 - 9}{x - 3}$ 103) _____

Graph the function.

104) $f(x) = \dfrac{2x}{x^2 + 4x + 3}$ 104) _____

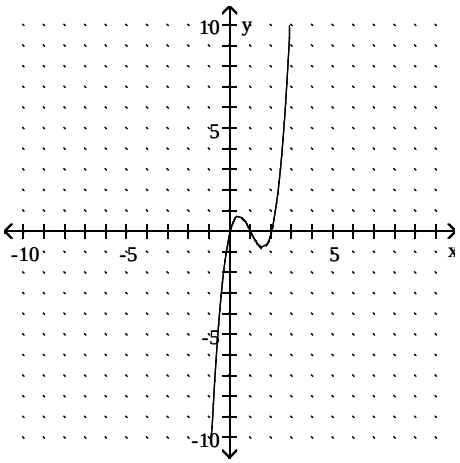
Solve the problem.

105) If the average cost per unit C(x) to produce x units of plywood is given by $C(x) = \dfrac{1500}{x + 50}$, what do 800 units cost? 105) _____

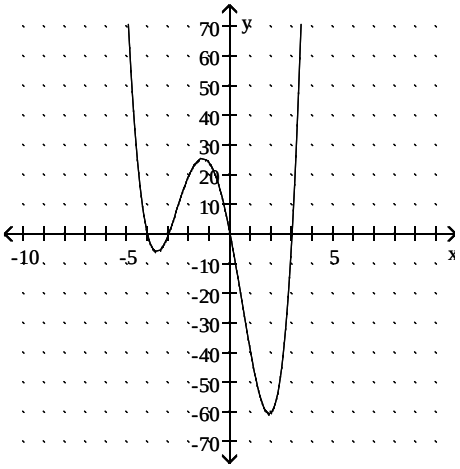
106) In the following formula, f(x) is the minimum number of hours of studying required to attain a test score of x: $f(x) = \dfrac{0.55x}{100.5 - x}$. How many hours of study are needed to score 99? 106) _____

1) not a polynomial function
2) not a polynomial function
3) not a polynomial function
4) Degree: 6, leading term: $3x^6$, leading coefficient: 3
5) not a polynomial function
6) not a polynomial function
7) B
8) x = –9, multiplicity 2; x = 9, multiplicity 3
9) x = –1, multiplicity 3; x = 0, multiplicity 2; x = 6, multiplicity 1
10) x = –12, multiplicity 1; x = 0, multiplicity 1; x = $\frac{1}{2}$, multiplicity 1; x = 5, multiplicity 1
11) x = 2, multiplicity 3 ; x = –2, multiplicity 3
12) x = –5, multiplicity 2; x = –8, multiplicity 2
13) x = 0, touches the x–axis and turns around; x = 6, crosses the x–axis
14) x = 0, touches the x–axis and turns around; x = 5, crosses the x–axis; x = –5, crosses the x–axis
15) x = 0, touches the x–axis and turns around; x = –8, crosses the x–axis; x = 2, crosses the x–axis
16) x = –1, crosses the x–axis; x = 4, crosses the x–axis; x = 1, touches the x–axis and turns around
17) y → ∞ as x → -∞ and y → -∞ as x → ∞
18) y → ∞ as x → -∞ and y → -∞ as x → ∞
19) y → ∞ as x → -∞ and y → ∞ as x → ∞
20) y → -∞ as x → -∞ and y → -∞ as x → ∞
21) y → -∞ as x → -∞ and y → -∞ as x → ∞
22) 2
23) 7
24) 0
25) 2
26) 10
27) 0
28) –5
29) 0
30) 0

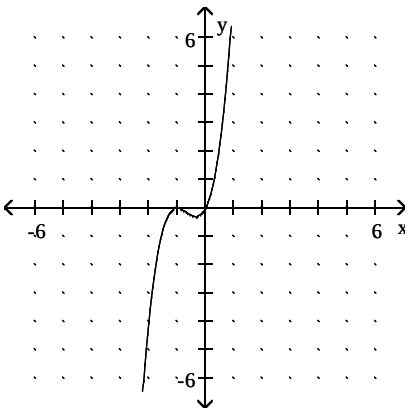
31)



32)



33)



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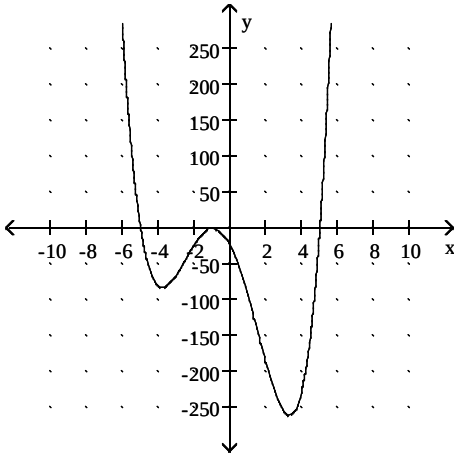
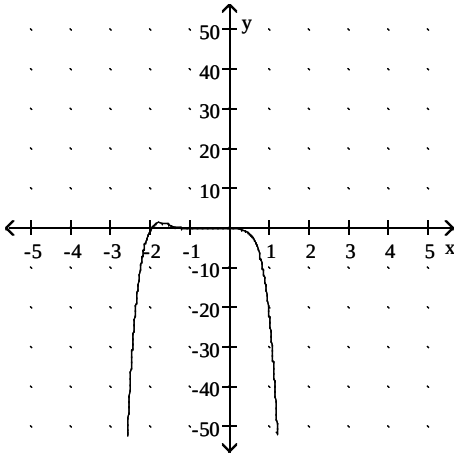
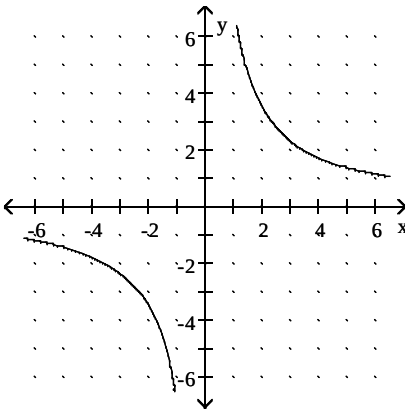


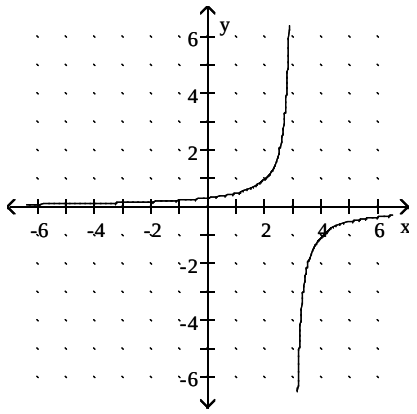
35)



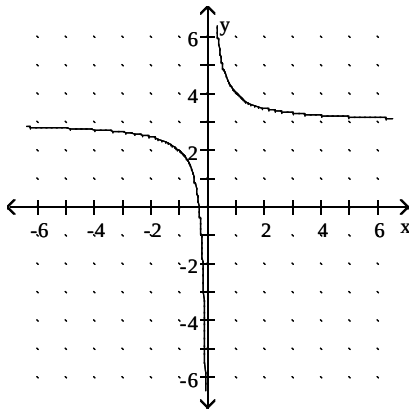
36) Yes
37) 2.7
38) 693.3
39) 12°C
40) quotient: x – 5; remainder: 0
41) quotient: $2x^2 - 5x - 4$: remainder: 19
42) quotient: $x^2 + x - 5$; remainder: 30
43) quotient: $x^2 - 4x + 16$; remainder: 0
44) quotient: $x^2 + x + 1$; remainder: –4
45) quotient: $x^4 + 2x^3 - 2x^2 + 2x + 3$; remainder: 3
46) quotient: $6x^4 - 8x^3 + 4x^2 - 2x + 2$; remainder –5
47) quotient: $2x^3 - 7x^2 + 6x - 15$; remainder: 45
48) –3
49) 15
50) –1
51) Yes
52) No
53) Yes
54) No
55) No
56) {±1, ±2, ±3, ±4, ±6, ±8, ±12, ±24}
57) $\left\{\pm 1, \pm\frac{1}{2}, \pm 2, \pm 4, \pm 8\right\}$
58) $\left\{\pm 1, \pm\frac{1}{3}, \pm 3, \pm 9, \pm 27\right\}$
59) $\left\{\pm 1, \pm 19, \pm\frac{1}{2}, \pm\frac{19}{2}\right\}$
60) {–4, –8, 6}
61) {3, 5, –1}
62) $\left\{\frac{1}{2}, -\frac{1}{2}, 7\right\}$
63) $\left\{-\frac{1}{3}, \frac{1}{4}, -4\right\}$
64) $21.86
65) {7i, –7i}
66) $\{-16 + i\sqrt{6}, -16 - i\sqrt{6}\}$
67) {–2, 2, 2i, –2i}
68) {3 + 5i, 3 – 5i}
69) 4 + i
70) –i, 3 – i
71) 4 + 5i, –9i
72) 5 + 5i
73) $-4x^3 + 60x^2 - 364x + 820$
74) $2x^6 - 26x^5 + 120x^4 - 200x^3$
75) 2i, 3, –3
76) 1 – i, –4
77) 3 + 2i, 3 – 2i
78) 6, –i, i
79) $\frac{1}{4}$, 1 + 3i, 1 – 1i
80) 2, 3, –2i, 2i
81)



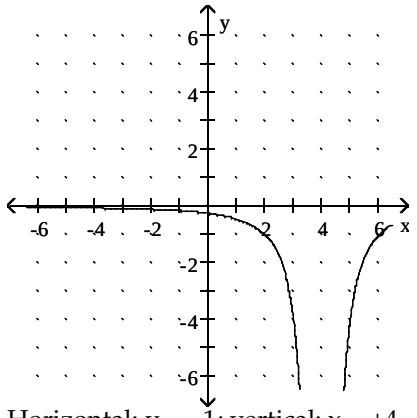
82)



83)



84)



85) Horizontal: $y = -1$; vertical: $x = \pm 4$

86) Domain: $(-\infty, -4) \cup (-4, \infty)$; Range: $(-\infty, 1) \cup (1, \infty)$

87) $x = 1$

88) None

89) $x = 3$, $x = -3$

90) $x = 0$, $x = -3$

91) Horizontal: $y = -2$; vertical: $x = -1$

92) $y = 1$

93) None

94) $y = 0$

95) $y = 2$

96) $y = 9/8$

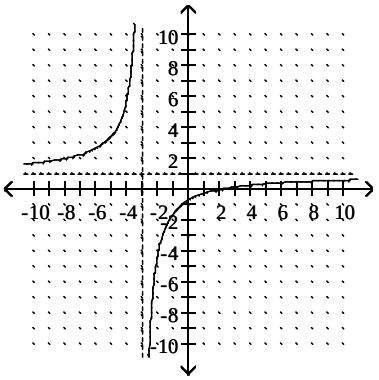
97) None

98) $y = x + 6$

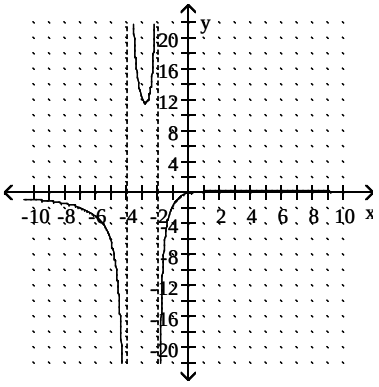
99) $y = x - 18$

100) Vertical: $x = -1$; horizontal: $y = -4$; $(-\infty, -1) \cup (-1, \infty)$

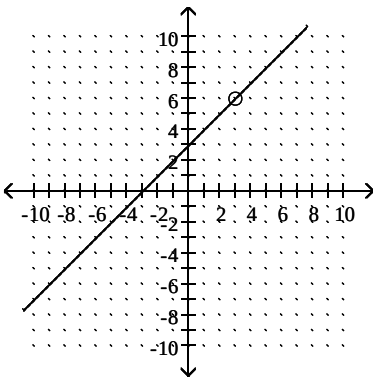
101)



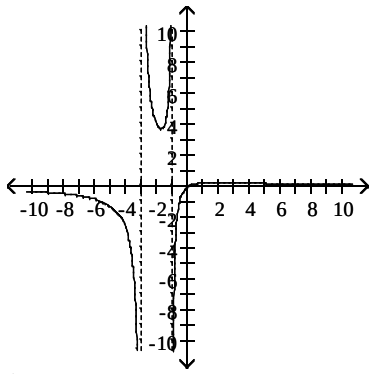
102)



103)



104)



105) $1411.76

106) 36.30 hr