Review Test 3

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

State whether the function is a polynomial function or not. If it is, give its degree. If it is not, tell why not.

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

A) Yes; degree 3 B) Yes; degree 1 C) Yes; degree 2 D) Yes; degree 4

2) $f(x) = \frac{8 - x^4}{9}$ 2) _____

A) Yes; degree 1
B) No; x is a negative term
C) Yes; degree 4
D) No; it is a ratio

3) $f(x) = 8$ 3) _____

A) No; it is a constant
B) Yes; degree 0
C) Yes; degree 1
D) No; it contains no variables

4) $f(x) = 8 - \frac{3}{x^2}$ 4) _____

A) Yes; degree –2
B) Yes; degree $\frac{1}{2}$
C) Yes; degree 2
D) No; x is raised to the negative 2 power

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

A) Yes; degree 3
B) Yes; degree 4
C) No; x is raised to non–integer 4/3 power
D) Yes; degree 4/3

6) $f(x) = 11x^5 + \pi x^4 + \frac{4}{7}$ 6) _____

A) Yes; degree 9
B) Yes; degree 10
C) No; x^4 has a non–integer coefficient
D) Yes; degree 5

Form a polynomial whose zeros and degree are given. Use a leading coefficient of 1.

7) Zeros: –3, –1, 2; degree 3 7) _____

A) $f(x) = x^3 + 2x^2 - 5x - 6$
B) $f(x) = x^3 + 2x^2 + 5x + 6$
C) $f(x) = x^3 - 2x^2 - 5x + 6$
D) $f(x) = x^3 - 2x^2 + 5x - 6$

For the polynomial, list each real zero and its multiplicity. Determine whether the graph crosses or touches the x –axis at each x –intercept.

8) $f(x) = \left(x + \frac{1}{5}\right)^2 (x + 2)^3$ 8) _____

A) $-\frac{1}{5}$, multiplicity 2, crosses x–axis; –2, multiplicity 3, touches x–axis

B) $\frac{1}{5}$, multiplicity 2, crosses x–axis; 2, multiplicity 3, touches x–axis

C) $\frac{1}{5}$, multiplicity 2, touches x–axis; 2, multiplicity 3, crosses x–axis

D) $-\frac{1}{5}$, multiplicity 2, touches x–axis; –2, multiplicity 3, crosses x–axis

Form a polynomial whose zeros and degree are given. Use a leading coefficient of 1.

9) Zeros: –1, 1, – 5; degree 3 9) _____

A) $f(x) = x^3 - 5x^2 + x - 5$ B) $f(x) = x^3 - 5x^2 - x + 5$

C) $f(x) = x^3 + 5x^2 - x - 5$ D) $f(x) = x^3 + 5x^2 + x + 5$

10) Zeros: 2, multiplicity 2; –2, multiplicity 2; degree 4 10) _____

A) $f(x) = x^4 + 8x^2 + 16$ B) $f(x) = x^4 - 4x^3 + 8x^2 - 8x + 16$

C) $f(x) = x^4 + 4x^3 - 8x^2 + 8x - 16$ D) $f(x) = x^4 - 8x^2 + 16$

11) Zeros: –4, –1, 4, 5; degree 4 11) _____

A) $x^4 + 4x^3 - 21x^2 - 64x + 80$ B) $x^4 + 24x^2 + 80$

C) $x^4 - 4x^3 - 21x^2 + 64x + 80$ D) $x^4 - 4x^3 - 21x^2 + 80x + 80$

For the polynomial, list each real zero and its multiplicity. Determine whether the graph crosses or touches the x –axis at each x –intercept.

12) $f(x) = 2(x^2 + 1)(x + 5)^2$ 12) _____

A) –1, multiplicity 1, touches x–axis; –5, multiplicity 2, crosses x–axis

B) –5, multiplicity 2, crosses x–axis

C) –5, multiplicity 2, touches x–axis

D) –1, multiplicity 1, crosses x–axis; –5, multiplicity 2, touches x–axis

13) $f(x) = \frac{1}{2}x^2(x^2 - 3)(x + 6)$ 13) _____

A) 0, multiplicity 2, crosses x–axis;
–6, multiplicity 1, touches x–axis

B) 0, multiplicity 2, touches x–axis;
–6, multiplicity 1, crosses x–axis;
$\sqrt{3}$, multiplicity 1, crosses x–axis;
$-\sqrt{3}$, multiplicity 1, crosses x–axis

C) 0, multiplicity 2, crosses x–axis;
–6, multiplicity 1, touches x–axis;
$\sqrt{3}$, multiplicity 1, touches x–axis;
$-\sqrt{3}$, multiplicity 1, touches x–axis

D) 0, multiplicity 2, touches x–axis;
–6, multiplicity 1, crosses x–axis

Find the x– and y–intercepts of f.

14) $f(x) = 4x^5(x - 9)^3$ 14) _____

A) x–intercepts: 0, –9; y–intercept: 4
B) x–intercepts: 0, 9; y–intercept: 4
C) x–intercepts: 0, –9; y–intercept: 0
D) x–intercepts: 0, 9; y–intercept: 0

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

A) x–intercepts: –3, –2, 2; y–intercept: –12
B) x–intercepts: –3, –2, 2; y–intercept: 12
C) x–intercepts: –2, 2, 3; y–intercept: –12
D) x–intercepts: –2, 2, 3; y–intercept: 12

16) $f(x) = (x + 1)(x - 8)(x - 1)^2$ 16) _____

A) x–intercepts: –1, 1, 8; y–intercept: 8
B) x–intercepts: –1, 1, –8; y–intercept: 8
C) x–intercepts: –1, 1, 8; y–intercept: –8
D) x–intercepts: –1, 1, –8; y–intercept: –8

17) $f(x) = -x^2(x + 3)(x^2 + 1)$ 17) _____

A) x–intercepts: –3, –1, 0; y–intercept: 3
B) x–intercepts: –3, 0; y–intercept: 0
C) x–intercepts: –3, –1, 0; y–intercept: –3
D) x–intercepts: –3, –1, 0, 1; y–intercept: 0

Find the power function that the graph of f resembles for large values of $|x|$.

18) $f(x) = (x - 3)^3$ 18) _____

A) $y = x^9$ B) $y = x^3$ C) $y = x^{-27}$ D) $y = x^{-3}$

Determine the maximum number of turning points of f.

19) $f(x) = -x^2(x + 6)^3(x^2 - 1)$ 19) _____

A) 6 B) 5 C) 7 D) 2

Use the x–intercepts to find the intervals on which the graph of f is above and below the x–axis.

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

A) above the x–axis: $(-3, \infty)$
below the x–axis: $(-\infty, -3)$
B) above the x–axis: $(-\infty, -3)$
below the x–axis: $(-3, \infty)$
C) above the x–axis: no intervals
below the x–axis: $(-\infty, -3), (-3, \infty)$
D) above the x–axis: $(-\infty, -3), (-3, \infty)$
below the x–axis: no intervals

21) $f(x) = (x - 3)^2(x + 4)^2$ 21) _____

A) above the x–axis: no intervals
below the x–axis: $(-\infty, -4), (-4, 3), (3, \infty)$
B) above the x–axis: $(-\infty, -4), (3, \infty)$
below the x–axis: $(-4, 3)$
C) above the x–axis: $(-4, 3)$
below the x–axis: $(-\infty, -4), (3, \infty)$
D) above the x–axis: $(-\infty, -4), (-4, 3), (3, \infty)$
below the x–axis: no intervals

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

Analyze the graph of the given function f as follows:
(a) Determine the end behavior: find the power function that the graph of f resembles for large values of |x|.
(b) Find the x– and y–intercepts of the graph.
(c) Determine whether the graph crosses or touches the x–axis at each x–intercept.
(d) Graph f using a graphing utility.
(e) Use the information obtained in (a) – (e) to draw a complete graph of f by hand. Label all intercepts and turning points.
(f) Find the domain of f. Use the graph to find the range of f.
(g) Use the graph to determine where f is increasing and where f is decreasing.

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

23) $f(x) = -x^2(x - 1)(x + 3)$ 23) _____

Solve the problem.

24) For the polynomial function $f(x) = 2x^4 - 7x^3 + 11x - 4$ 24) _____

a) Find the x– and y–intercepts of the graph of f. Round to two decimal places, if necessary.

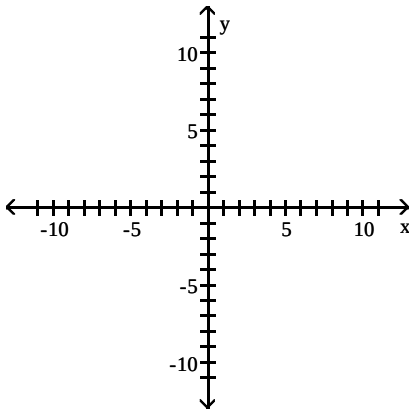
b) Determine whether the graph crosses or touches the x–axis at each x–intercept.

c) End behavior: find the power function that the graph of f resembles for large values of |x|.

d) Use a graphing utility to graph the function.Approximate the local maxima rounded to two decimal places, if necessary. Approximate the local minima rounded to two decimal places, if necessary.

e) Determine the number of turning points on the graph.

f) Put all the information together, and connect the points with a smooth, continuous curve to obtain the graph of f.



MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

Use the Remainder Theorem to find the remainder when f(x) is divided by x – c.

25) $f(x) = x^4 + 8x^3 + 12x^2;\ x + 1$ 25) _____

A) R = 5 B) R = –21 C) R = –5 D) R = 21

Use the Factor Theorem to determine whether x – c is a factor of f(x).

26) $f(x) = x^3 + 6x^2 - 14x + 16;\ x + 8$ 26) _____

A) Yes B) No

27) $f(x) = x^4 - 21x^2 - 100;\ x - 10$ 27) _____

A) Yes B) No

28) $f(x) = 7x^4 + 20x^3 - 3x^2 + x - 3;\ x + 3$ 28) _____

A) Yes B) No

List the potential rational zeros of the polynomial function. Do not find the zeros.

29) $f(x) = 6x^4 + 2x^3 - 3x^2 + 2$ 29) _____

A) $\pm\frac{1}{6}, \pm\frac{1}{3}, \pm\frac{1}{2}, \pm 1, \pm 2$ B) $\pm\frac{1}{6}, \pm\frac{1}{3}, \pm\frac{1}{2}, \pm\frac{2}{3}, \pm 1, \pm 2$

C) $\pm\frac{1}{2}, \pm\frac{3}{2}, \pm 1, \pm 2, \pm 3, \pm 6$ D) $\pm\frac{1}{6}, \pm\frac{1}{3}, \pm\frac{1}{2}, \pm\frac{2}{3}, \pm 1, \pm 2, \pm 3$

30) $f(x) = -4x^4 + 2x^2 - 3x + 6$ 30) _____

A) $\pm\frac{1}{6}, \pm\frac{1}{2}, \pm\frac{1}{3}, \pm\frac{2}{3}, \pm\frac{4}{3}, \pm 1, \pm 2, \pm 4$ B) $\pm\frac{1}{4}, \pm\frac{1}{2}, \pm\frac{2}{3}, \pm\frac{3}{4}, \pm\frac{3}{2}, \pm 1, \pm 2, \pm 3, \pm 6$

C) $\pm\frac{1}{4}, \pm\frac{1}{2}, \pm\frac{3}{4}, \pm\frac{3}{2}, \pm 1, \pm 2, \pm 3, \pm 4, \pm 6$ D) $\pm\frac{1}{4}, \pm\frac{1}{2}, \pm\frac{3}{4}, \pm\frac{3}{2}, \pm 1, \pm 2, \pm 3, \pm 6$

31) $f(x) = x^5 - 5x^2 + 2x + 2$ 31) _____

A) $\pm 1, \pm\frac{1}{2}$ B) $\pm 2, \pm\frac{1}{2}$ C) $\pm 1, \pm 2$ D) $\pm\frac{1}{5}, \pm\frac{2}{5}, \pm 2$

32) $f(x) = x^5 - 3x^2 + 3x + 6$ 32) _____

A) $\pm 1, \pm 3, \pm 2$ B) $\pm 1, \pm\frac{1}{3}, \pm\frac{1}{2}, \pm\frac{1}{6}, \pm 3, \pm 2, \pm 6$

C) $\pm 1, \pm\frac{1}{3}, \pm\frac{1}{2}, \pm\frac{1}{6}$ D) $\pm 1, \pm 3, \pm 2, \pm 6$

Use the Rational Zeros Theorem to find all the real zeros of the polynomial function. Use the zeros to factor f over the real numbers.

33) $f(x) = x^4 + 8x^2 - 9$ 33) _____

A) $-1, -3, 1, 3;\ f(x) = (x - 1)(x + 1)(x - 3)(x + 3)$

B) $-3, 3;\ f(x) = (x - 3)(x + 3)(x^2 + 1)$

C) $-1, 1;\ f(x) = (x - 1)(x + 1)(x^2 + 9)$

D) $1;\ f(x) = (x - 1)^2(x^2 + 9)$

34) $f(x) = 2x^3 - 3x^2 + 6x - 9$ 34) _____

A) $9;\ f(x) = (x - 9)(2x^2 + 1)$ B) $3, \frac{3}{2}, 1;\ f(x) = (2x - 3)(x - 1)(x - 3)$

C) $-3, -1, \frac{3}{2};\ f(x) = (2x - 3)(x + 1)(x + 3)$ D) $\frac{3}{2};\ f(x) = (2x - 3)(x^2 + 3)$

35) $f(x) = 5x^4 - 9x^3 + 29x^2 - 45x + 20$ 35) _____

A) $-5, -1, 1, \frac{4}{5}$; $f(x) = (x - 1)(5x - 4)(x + 1)(x + 5)$

B) $1, \frac{4}{5}$; $f(x) = (x - 1)(5x - 4)(x^2 + 5)$

C) $5, \frac{4}{5}$; $f(x) = (x - 5)(5x - 4)(x^2 + 1)$

D) $-5, -1, 1, -\frac{4}{5}$; $f(x) = (x - 1)(5x + 4)(x + 1)(x + 5)$

Find the intercepts of the function f(x).

36) $f(x) = x^3 + 3x^2 - 4x - 12$ 36) _____

A) x–intercept: –3; y–intercept: –12
B) x–intercepts: –3, –2, 2; y–intercept: –12
C) x–intercept: –2; y–intercept: –12
D) x–intercepts: –2, 2, 3; y–intercept: –12

37) $f(x) = 3x^3 - x^2 - 15x + 5$ 37) _____

A) x–intercepts: $-3, \sqrt{5}, -\sqrt{5}$; y–intercept: 5
B) x–intercepts: $3, \sqrt{5}, -\sqrt{5}$; y–intercept: 5
C) x–intercepts: $\frac{1}{3}, \sqrt{5}, -\sqrt{5}$; y–intercept: 5
D) x–intercepts: $-\frac{1}{3}, \sqrt{5}, -\sqrt{5}$; y–intercept: 5

38) $f(x) = 4x^4 - 16x^3 + 17x^2 - 4x + 4$ 38) _____

A) x–intercept: 2; y–intercept: 4
B) x–intercepts: none; y–intercept: 4
C) x–intercept: –2; y–intercept: 4
D) x–intercepts: –2, 2; y–intercept: 4

39) $f(x) = -x^2(x + 3)(x^2 - 1)$ 39) _____

A) x–intercepts: –3, –1, 0, 1; y–intercept: 0
B) x–intercepts: –3, 0, 1; y–intercept: –3
C) x–intercepts: –1, 0, 1, 3; y–intercept: 0
D) x–intercepts: –3, –1, 0, 1; y–intercept: –3

40) $f(x) = (x - 3)^2(x^2 - 25)$ 40) _____

A) x–intercepts: –3, –25; y–intercept: 75
B) x–intercepts: –5, 3, 5; y–intercept: 225
C) x–intercepts: –5, 3, 5; y–intercept: –225
D) x–intercepts: 3, 25; y–intercept: 75

Solve the equation in the real number system.

41) $x^3 + 6x^2 + 11x + 6 = 0$ 41) _____

A) {2, 1, 3} B) {1, 3} C) {–3, –1} D) {–3, –1, –2}

42) $2x^3 - x^2 - 10x + 5 = 0$ 42) _____

A) $\{ 2, \sqrt{5}, -\sqrt{5} \}$
B) $\left\{\frac{1}{2}, \sqrt{5}, -\sqrt{5}\right\}$
C) $\left\{-\frac{1}{2}, \sqrt{5}, -\sqrt{5}\right\}$
D) $\{ -2, \sqrt{5}, -\sqrt{5} \}$

43) $2x^3 - 9x^2 + 7x + 6 = 0$ 43) _____

A) $\left\{-\frac{1}{2}, 2, 3\right\}$ B) $\left\{\frac{1}{2}, 2, -3\right\}$ C) $\left\{-\frac{3}{2}, -1, -2\right\}$ D) $\left\{\frac{3}{2}, -1, 2\right\}$

44) $x^4 - 3x^3 + 5x^2 - x - 10 = 0$ 44) _____

A) {1, 2} B) {–1, 2} C) {–1, –2} D) {–2, 1}

45) $2x^4 - 2x^3 + x^2 - 5x - 10 = 0$ 45) _____

A) $\left\{-\frac{\sqrt{10}}{2}, \frac{\sqrt{10}}{2}\right\}$ B) $\left\{-\frac{5}{2}, \frac{5}{2}\right\}$ C) {–1, 2} D) {1, –2}

Information is given about a polynomial f(x) whose coefficients are real numbers. Find the remaining zeros of f.

46) Degree 3; zeros: 2, 4 – i 46) _____

A) 4 + i B) –4 + i C) –2 D) no other zeros

47) Degree 3; zeros: –8, 8 – 5i 47) _____

A) 8 + 5i B) 8, 8 + 5i C) –8 + 5i D) 8, –8 + 5i

48) Degree 5; zeros: 5, 6 + 5i, –5i 48) _____

A) –5, 6 – 5i, 5i B) 6 – 5i, 5i C) –6 + 5i, 5i D) –6 – 5i, 5i

49) Degree 6; zeros: –4, 3, 4 – 5i, –3 + i 49) _____

A) 4, 4 + 5i, –3 – i B) 4, 4 + 5i C) 4 + 5i, –3 – i D) –4 + 5i, 3 – i

Form a polynomial f(x) with real coefficients having the given degree and zeros.

50) Degree 3: zeros: 1 + i and –5 50) _____

A) $f(x) = x^3 + 3x^2 - 8x + 10$ B) $f(x) = x^3 - 5x^2 - 8x - 12$

C) $f(x) = x^3 + 3x^2 + 10x - 8$ D) $f(x) = x^3 + x^2 - 8x + 10$

51) Degree: 3; zeros: –2 and 3 + i. 51) _____

A) $f(x) = x^3 - 6x^2 - 10x + 20$ B) $f(x) = x^3 - 8x^2 + 2x + 20$

C) $f(x) = x^3 - 4x^2 - 2x + 20$ D) $f(x) = x^3 - 4x^2 - 10x + 20$

52) Degree: 4; zeros: –1, 2, and 1 – 2i. 52) _____

A) $f(x) = x^4 - x^3 + x^2 + 9x - 10$ B) $f(x) = x^4 - 3x^3 - 3x^2 + 7x + 6$

C) $f(x) = x^4 - x^3 + 3x^2 - 5x - 10$ D) $f(x) = x^4 - 3x^3 + 5x^2 - x - 10$

53) Degree: 4; zeros: 1, –1, and 4 – 2i 53) _____

A) $f(x) = x^4 - 8x^3 + 16x^2 + 8x + 17$ B) $f(x) = x^4 + 8x^3 + 16x^2 - 8x + 17$

C) $f(x) = x^4 - 8x^3 + 16x^2 + 8x - 17$ D) $f(x) = x^4 + 8x^3 + 16x^2 - 8x - 17$

54) Degree: 5; zeros: 2, –3i, and 4 – i 54) _____

A) $f(x) = x^5 - 10x^4 + 42x^3 - 124x^2 + 297x - 306$

B) $f(x) = x^5 - 10x^4 + 26x^3 - 124x^2 + 72x + 306$

C) $f(x) = x^5 - 10x^4 - 42x^3 - 124x^2 + 297x + 306$

D) $f(x) = x^5 - 10x^4 + 26x^3 - 124x^2 - 72x - 306$

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

55) $f(x) = x^4 - 32x^2 - 144$; zero: $-2i$ 55) _____

A) 2i, 12i, –12i B) 2i, 12, –12 C) 2i, 6, –6 D) 2i, 6i, –6i

56) $f(x) = x^3 - 2x^2 - 11x + 52$; zero: -4 56) _____

A) $1 + 2\sqrt{13}i$, $1 - 2\sqrt{13}i$ B) 1 + 2i, 1 – 2i

C) 6 + 4i, 6 – 4i D) 3 + 2i, 3 – 2i

57) $f(x) = 3x^4 - 22x^3 + 82x^2 - 142x + 39$; zero: $2 + 3i$ 57) _____

A) $3 - 2i, -3, -\frac{1}{3}$ B) $2 - 3i, -3, \frac{1}{3}$ C) $3 - 2i, 3, -\frac{1}{3}$ D) $2 - 3i, 3, \frac{1}{3}$

58) $f(x) = x^5 - 10x^4 + 42x^3 - 124x^2 + 297x - 306$; zero: $3i$ 58) _____

A) –2, –3i, 4 – i, 4 + i B) –2, –3i, –4 – i, –4 + i

C) 2, –3i, –4 – i, –4 + i D) 2, –3i, 4 – i, 4 + i

Find all zeros of the function and write the polynomial as a product of linear factors.

59) $f(x) = x^3 + 11x^2 + 36x + 26$ 59) _____

A) f(x) = (x + 1)(x + 5 + i)(x – 5 – i) B) f(x) = (x + 1)(x + 5 + i)(x + 5 – i)

C) $f(x) = (x + 1)(x + 5 + i\sqrt{2})(x - 1 - i\sqrt{2})$ D) $f(x) = (x - 1)(x + 5 + i\sqrt{2})(x + 5 - i\sqrt{2})$

60) $f(x) = x^3 + 9x^2 + 32x + 42$ 60) _____

A) f(x) = (x – 3)(x + 5 + 3i)(x + 5 – 3i) B) f(x) = (x – 3)(x + 5 + 3i)(x – 5 – 3i)

C) $f(x) = (x + 3)(x + 3 + i\sqrt{5})(x + 3 - i\sqrt{5})$ D) $f(x) = (x + 3)(x + 3 + i\sqrt{5})(x - 3 - i\sqrt{5})$

61) $f(x) = x^4 + 6x^3 + 12x^2 + 24x + 32$ 61) _____

A) f(x) = (x – 4)(x + 2)(x – 2)(x + 2) B) $f(x) = (x - i\sqrt{8})(x + i\sqrt{8})(x - 2)(x + 2)$

C) f(x) = (x + 4)(x + 2)(x – 2i)(x + 2i) D) f(x) = (x – 1)(x – 8)(x – 2i)(x + 2i)

62) $f(x) = 3x^4 + 5x^3 + 10x^2 + 20x - 8$ 62) _____

A) f(x) = (3x + 1)(x – 2)(x + 2i)(x – 2i) B) f(x) = (3x – 1)(x + 2)(x + 2i)(x – 2i)

C) f(x) = (3x – 1)(x + 2)(x + 2)(x – 2) D) f(x) = (3x + 1)(x – 2)(x + 2)(x – 2)

Find the domain of the rational function.

63) $g(x) = \frac{9x^2}{(x + 6)(x - 3)}$ 63) _____

A) {x | x ≠ 6, x ≠ –3} B) {x | x ≠ –6, x ≠ 3}

C) {x | x ≠ –6, x ≠ 3, x ≠ –9} D) all real numbers

64) $f(x) = \frac{x + 2}{x^2 + 9}$ 64) _____

A) {x | x ≠ –3, x ≠ 3, x ≠ –2} B) all real numbers

C) {x | x ≠ 0, x ≠ –9} D) {x | x ≠ –3, x ≠ 3}

65) $g(x) = \dfrac{x}{x^3 - 125}$ 65) _____

A) $\{x|x \neq -5\}$ B) $\{x|x \neq 5\}$ C) $\{x|x \neq -5, 5\}$ D) $\{x|x \neq 25\}$

Find the vertical asymptotes of the rational function.

66) $g(x) = \dfrac{5x}{(x + 4)(x + 7)}$ 66) _____

A) $x = 4, x = 7$ B) $x = -4, x = -7, x = -5$
C) $x = -5$ D) $x = -4, x = -7$

67) $f(x) = \dfrac{x(x - 1)}{x^3 + 16x}$ 67) _____

A) $x = -4, x = 4$ B) none
C) $x = 0, x = -4, x = 4$ D) $x = 0, x = -16$

68) $f(x) = \dfrac{x - 5}{25x - x^3}$ 68) _____

A) $x = 0, x = -5, x = 5$ B) $x = -5, x = 5$
C) $x = 0, x = -5$ D) $x = 0, x = 5$

69) $f(x) = \dfrac{-x^2 + 16}{x^2 + 5x + 4}$ 69) _____

A) $x = -1, x = 4$ B) $x = -1$ C) $x = -1, x = -4$ D) $x = 1, x = -4$

Give the equation of the horizontal asymptote, if any, of the function.

70) $f(x) = \dfrac{2x^2 + 3}{2x^2 - 3}$ 70) _____

A) $y = 3$ B) $y = 2$
C) $y = 1$ D) no horizontal asymptotes

71) $h(x) = \dfrac{5x - 7}{x - 2}$ 71) _____

A) $y = 0$ B) $y = 5$
C) $y = 2$ D) no horizontal asymptotes

72) $f(x) = \dfrac{8x^2 + 7}{8x^2 - 7}$ 72) _____

A) $y = 7$ B) $y = 1$
C) $y = 8$ D) no horizontal asymptotes

73) $h(x) = \dfrac{7x^3 - 7x - 6}{4x + 2}$ 73) _____

A) $y = \dfrac{7}{4}$ B) $y = 7$

C) $y = 0$ D) no horizontal asymptotes

74) $g(x) = \dfrac{x + 5}{x^2 - 9}$ 74) _____

A) $y = 0$
B) $y = -3, y = 3$
C) no horizontal asymptotes
D) $y = 1$

75) $f(x) = \dfrac{-x^2 + 16}{x^2 + 5x + 4}$ 75) _____

A) $y = 0$
B) $y = -1$
C) no horizontal asymptotes
D) $y = -16$

Give the equation of the oblique asymptote, if any, of the function.

76) $f(x) = \dfrac{x^2 + 8x - 2}{x - 2}$ 76) _____

A) $y = x + 10$
B) no oblique asymptotes
C) $y = x + 6$
D) $x = y + 10$

77) $f(x) = \dfrac{x^2 - 2x + 4}{x + 6}$ 77) _____

A) $x = y + 2$
B) $y = x + 6$
C) $y = x - 8$
D) no oblique asymptote

78) $g(x) = \dfrac{x + 6}{x^2 - 1}$ 78) _____

A) $y = 6x$
B) no oblique asymptote
C) $y = x + 6$
D) $y = 0$

79) $f(x) = \dfrac{x^2 - 5}{25x - x^4}$ 79) _____

A) $y = 0$
B) $y = x - 5$
C) $y = 25x$
D) no oblique asymptote

Find the domain of the rational function.

80) $h(x) = \dfrac{x + 5}{x^2 - 4x}$ 80) _____

A) $\{x \mid x \neq -2, 2, -5\}$
B) $\{x \mid x \neq 0, 4\}$
C) $\{x \mid x \neq -2, 2\}$
D) all real numbers

81) $f(x) = \dfrac{2x^2 - 4}{3x^2 + 6x - 24}$ 81) _____

A) $\{x \mid x \neq -4, -2, 2\}$
B) $\{x \mid x \neq -2, 4\}$
C) $\{x \mid x \neq -4, 2\}$
D) all real numbers

Find the indicated intercept(s) of the graph of the function.

82) y–intercept of $f(x) = \dfrac{x - 4}{x^2 + 2x - 7}$ 82) _____

A) $\left(0, \dfrac{4}{7}\right)$ B) $\left(0, -\dfrac{7}{4}\right)$ C) (0, 4) D) none

83) y–intercept of $f(x) = \dfrac{(x - 8)^2}{(x + 11)^3}$ 83) _____

A) $\left(0, -\dfrac{8}{11}\right)$ B) $\left(0, -\dfrac{64}{1331}\right)$ C) (0, 8) D) $\left(0, \dfrac{64}{1331}\right)$

84) x–intercepts of $f(x) = \dfrac{x^2 + 3}{x^2 + 2x + 7}$ 84) _____

A) (7, 0) B) (–3, 0)
C) $(\sqrt{3}, 0), (-\sqrt{3}, 0)$ D) none

85) x–intercepts of $f(x) = \dfrac{x^2 - 4}{3 + x^4}$ 85) _____

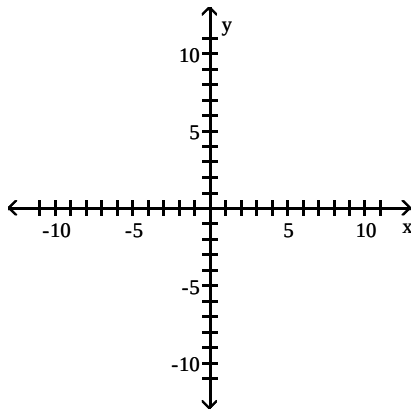
A) (3, 0) B) (4, 0) C) (–2, 0), (2, 0) D) none

86) x–intercepts of $f(x) = \dfrac{x^2 - x - 20}{x^2 + 5}$. 86) _____

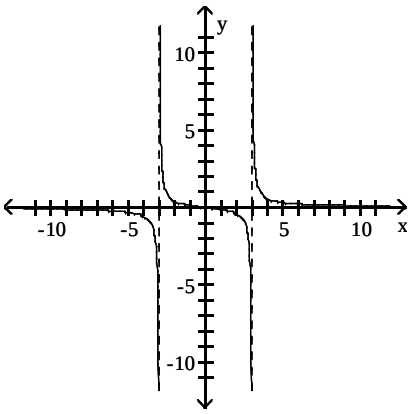
A) (–5, 0), (4, 0) B) (–4, 0), (5, 0) C) (–5, 0), (0, 0) D) (– 20, 0)

Graph the function.

87) $f(x) = x - \dfrac{9}{x}$ 87) _____



A)



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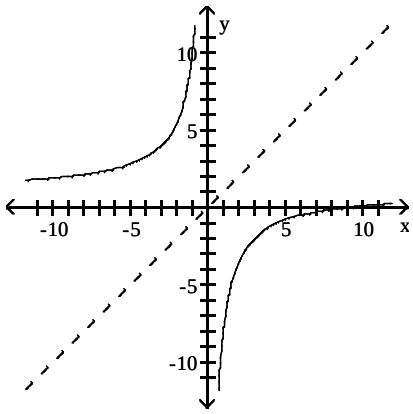

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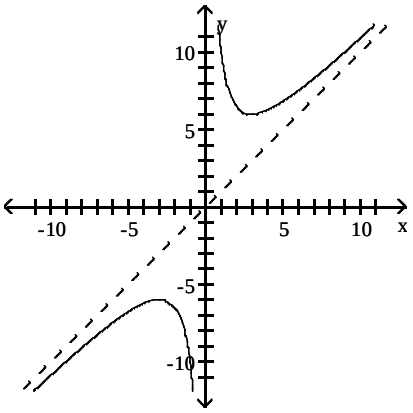
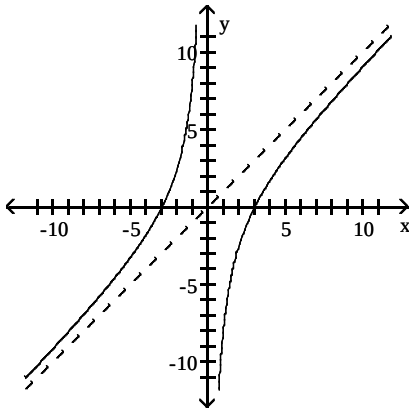
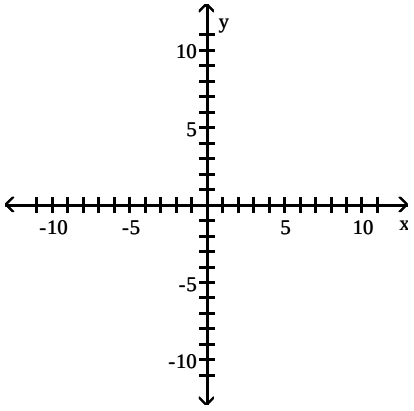


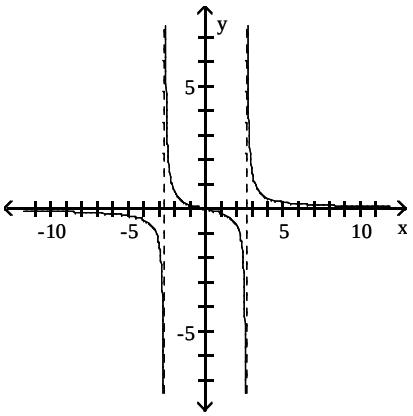
D)



88) $f(x) = \dfrac{x}{x^2 - 49}$ 88) _____



A)



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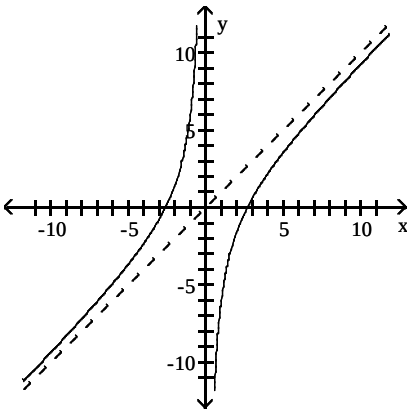

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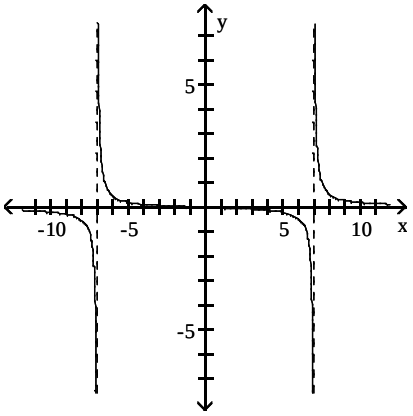
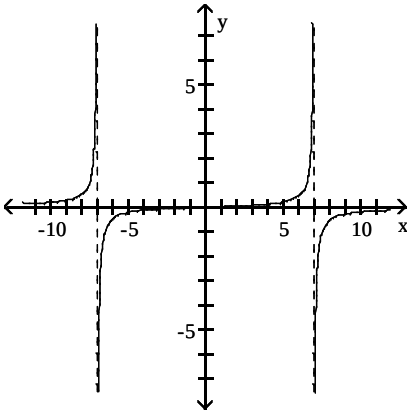
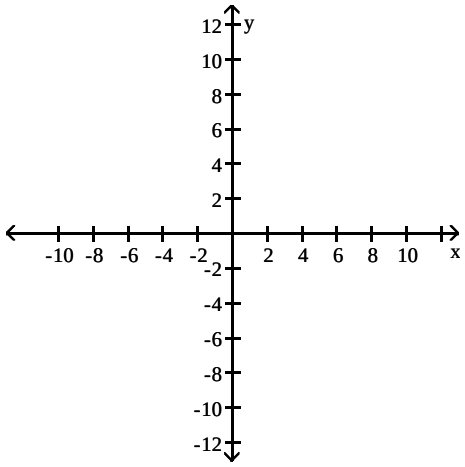


D)

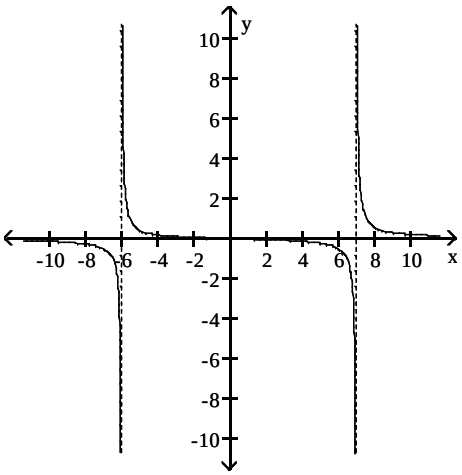


89) $f(x) = \dfrac{x^2 + x - 30}{x^2 - x - 42}$

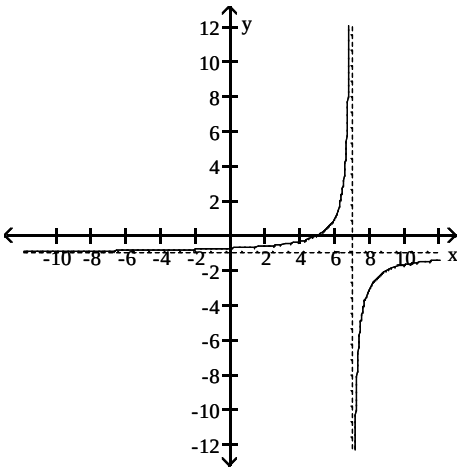
89) _____



A)



B)



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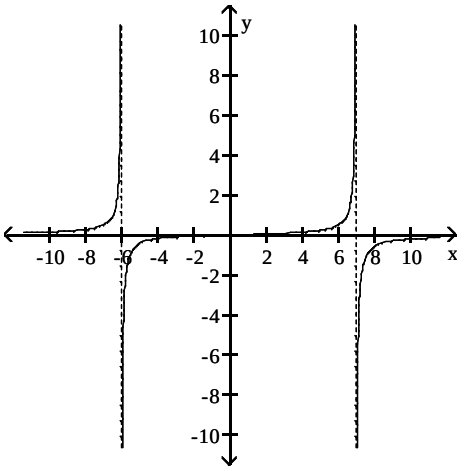
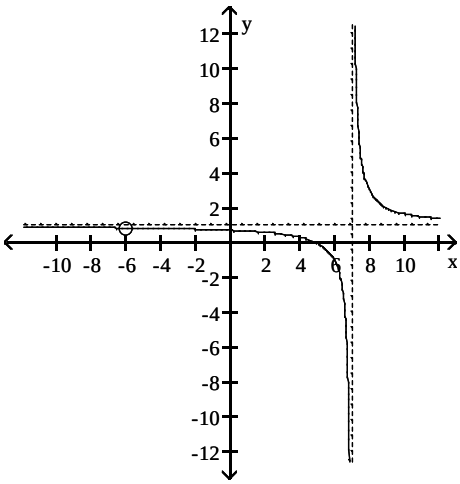
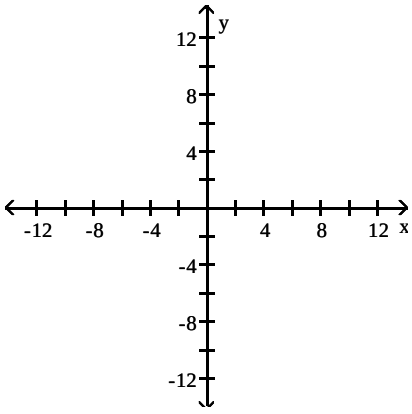


D)

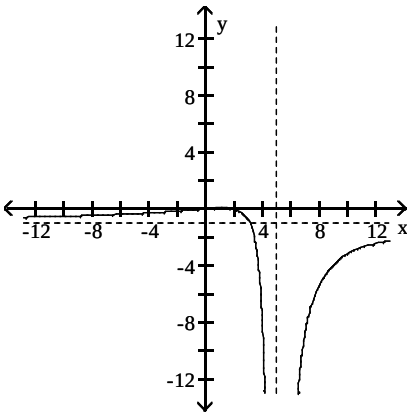


90) $f(x) = \dfrac{x^2 - 2x}{(x - 5)^2}$

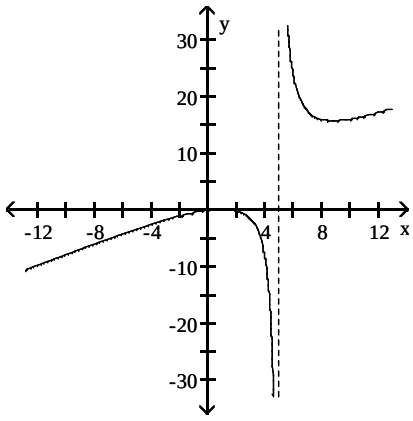
90) _____



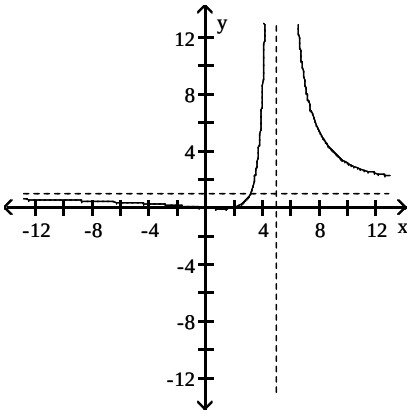
A)


y
x
12
8
4
-4
-8
-12
-12
-8
-4
4
8
12

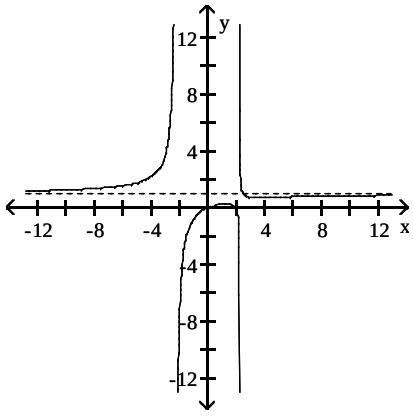
B)


y
x
30
20
10
-10
-20
-30
-12
-8
-4
4
8
12

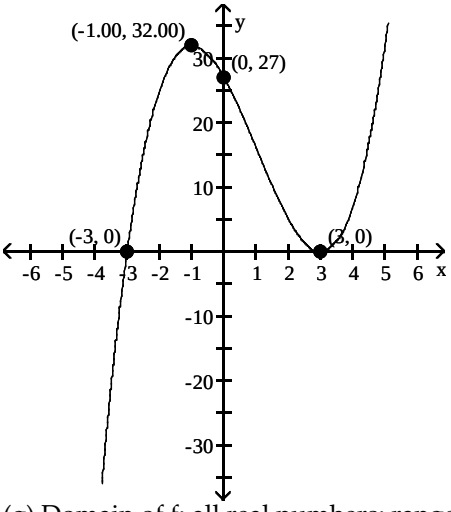
C)


y
x
12
8
4
-4
-8
-12
-12
-8
-4
4
8
12

D)

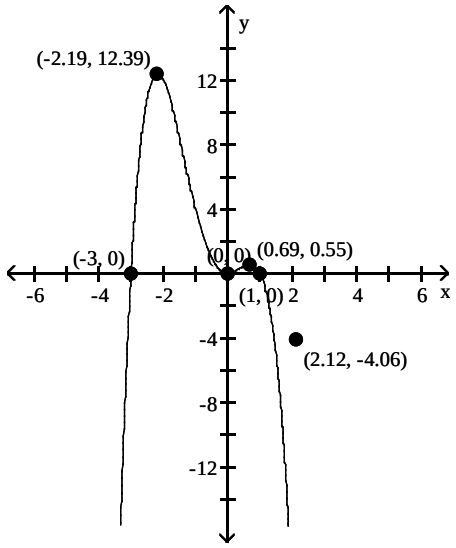

y
x
12
8
4
-4
-8
-12
-12
-8
-4
4
8
12

1) C
2) C
3) B
4) D
5) C
6) D
7) A
8) D
9) C
10) D
11) C
12) C
13) B
14) D
15) A
16) C
17) B
18) B
19) A
20) D
21) D
22) (a) For large values of $|x|$, the graph of f(x) will resemble the graph of $y = x^3$.
(b) y–intercept: (0, 27), x–intercepts: (3, 0) and (–3, 0)
(c) The graph of f crosses the x–axis at (–3, 0) and touches the x–axis at (3, 0).
(e) Local minimum at (3, 0); Local maximum at (–1.00, 32.00)
(f)



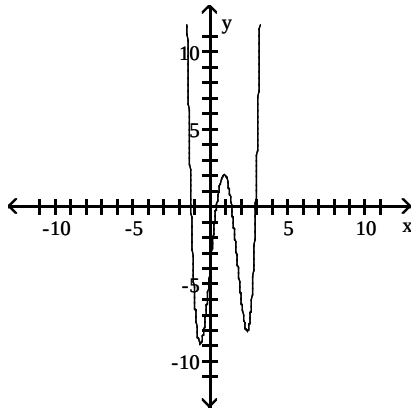
(g) Domain of f: all real numbers; range of f: all real numbers
(h) f is increasing on $(-\infty, -1.00)$ and $(3, \infty)$; f is decreasing on (32.00, 3)

23) (a) For large values of |x|, the graph of f(x) will resemble the graph of $y = -x^4$.
(b) y–intercept: (0, 0), x–intercepts: (–3, 0) , (0, 0), and (1, 0)
(c) The graph of f crosses the x–axis at (1, 0) and (–3, 0) and touches the x–axis at (0, 0).
(e) Local maxima at (–2.19, 12.39) and (0.69, 0.55); Local minimum at (0, 0)
(f)



(g) Domain of f: all real numbers; range of f: (–∞, 12.39]
(h) f is increasing on (–∞, –2.19) and (0, 0.69); f is decreasing on (–2.19, 0) and (0.69, ∞)

24) a) The x–intercepts are –1.23, 0.40, 1.38, and 2.94. The y–intercept is –4.
b) The graph crosses the x–axis at each x–intercept.
c) The graph resembles $f(x) = 2x^4$ for large values of |x|.
d) Maximum at (0.89, 2.11); minima at (–0.65, –8.87) and (2.38, –8.02)
e) The graph has 3 turning points.
f)



25) A
26) A
27) B
28) B
29) B
30) D
31) C

32) D
33) C
34) D
35) B
36) B
37) C
38) A
39) A
40) C
41) D
42) B
43) A
44) B
45) C
46) A
47) A
48) B
49) C
50) A
51) C
52) D
53) B
54) B
55) C
56) D
57) D
58) B
59) B
60) C
61) C
62) B
63) B
64) B
65) B
66) D
67) B
68) C
69) B
70) C
71) B
72) B
73) D
74) A
75) B
76) A
77) C
78) B
79) D
80) B
81) C

82) A
83) D
84) D
85) C
86) B
87) D
88) C
89) D
90) C