

Use Scantron 882E to transfer the answers. Be sure you keep your scantron CLEAN and FLAT before its submission.

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) $f(x) = -8x^5 - 7x^4 - 5$ 1) _____
 A) Yes; degree 5 B) No; the last term has no variable
 C) Yes; degree 10 D) Yes; degree 9

- 2) $f(x) = \frac{x^3 - 6}{x^2}$ 2) _____
 A) Yes; degree 2 B) No; it is a ratio of polynomials
 C) Yes; degree 3 D) Yes; degree -2

Form a polynomial whose zeros and degree are given.

- 3) Zeros: -2, -3, 3; degree 3 3) _____
 A) $f(x) = x^3 + 9x - 2x^2 - 18$ for $a = 1$ B) $f(x) = x^3 - 9x - 2x^2 + 18$ for $a = 1$
 C) $f(x) = x^3 + 9x + 2x^2 + 18$ for $a = 1$ D) $f(x) = x^3 - 9x + 2x^2 - 18$ for $a = 1$

- 4) Zeros: 3, multiplicity 2; -3, multiplicity 2; degree 4 4) _____
 A) $f(x) = x^4 - 18x^2 + 81$ B) $f(x) = x^4 - 6x^3 + 18x^2 - 27x + 81$
 C) $f(x) = x^4 + 18x^2 + 81$ D) $f(x) = x^4 + 6x^3 - 18x^2 + 27x - 81$

- 5) Zeros: -5, -4, -2, 1; degree 4 5) _____
 A) $x^4 + 10x^3 + 27x^2 - 40x - 40$ B) $x^4 + 10x^3 + 27x^2 + 2x - 40$
 C) $x^4 + 18x^2 - 40$ D) $x^4 - 10x^3 + 27x^2 - 2x - 40$

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

- 6) $f(x) = 5(x + 3)(x - 3)^3$ 6) _____
 A) -3, multiplicity 1, touches x-axis; 3, multiplicity 3
 B) 3, multiplicity 1, touches x-axis; -3, multiplicity 3
 C) -3, multiplicity 1, crosses x-axis; 3, multiplicity 3, crosses x-axis
 D) 3, multiplicity 1, crosses x-axis; -3, multiplicity 3, crosses x-axis

- 7) $f(x) = 2(x^2 + 4)(x + 1)^2$ 7) _____
 A) -1, multiplicity 2, touches x-axis
 B) -4, multiplicity 1, touches x-axis; -1, multiplicity 2, crosses x-axis
 C) -1, multiplicity 2, crosses x-axis
 D) -4, multiplicity 1, crosses x-axis; -1, multiplicity 2, touches x-axis

- 8) $f(x) = 3(x^2 + 1)(x^2 + 7)^2$ 8) _____
 A) -1, multiplicity 1, crosses x-axis; -7, multiplicity 2, touches x-axis
 B) -1, multiplicity 1, touches x-axis; -7, multiplicity 2, crosses x-axis
 C) No real zeros
 D) 1, multiplicity 1, crosses x-axis; -1, multiplicity 1, crosses x-axis;
 $\sqrt{7}$, multiplicity 2, touches x-axis; $-\sqrt{7}$, multiplicity 2, touches x-axis

Find the x- and y-intercepts of f.

9) $f(x) = 2x^3(x + 4)^5$

- A) x-intercepts: 0, 4; y-intercept: 2
 C) x-intercepts: 0, 4; y-intercept: 0

- B) x-intercepts: 0, -4; y-intercept: 0
 D) x-intercepts: 0, -4; y-intercept: 2

9) _____

10) $f(x) = (x + 4)(x - 2)(x + 2)$

- A) x-intercepts: -4, -2, 2; y-intercept: -16
 C) x-intercepts: -4, -2, 2; y-intercept: 16

- B) x-intercepts: -2, 2, 4; y-intercept: -16
 D) x-intercepts: -2, 2, 4; y-intercept: 16

10) _____

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

- A) x-intercepts: 0, -4; y-intercept: 0
 C) x-intercepts: 0, -4; y-intercept: 4

- B) x-intercepts: 0, 2, -2; y-intercept: 4
 D) x-intercepts: 0, 2, -2; y-intercept: 0

11) _____

Find the domain of the rational function.

12) $f(x) = \frac{x + 7}{x^2 - 9}$

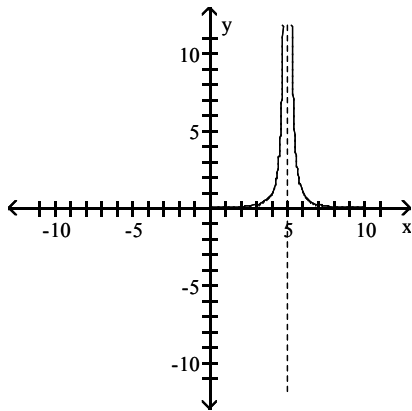
- A) $\{x \mid x \neq 0, x \neq 9\}$
 C) $\{x \mid x \neq -3, x \neq 3\}$

- B) $\{x \mid x \neq -3, x \neq 3, x \neq -7\}$
 D) all real numbers

12) _____

Use the graph to determine the domain and range of the function.

13)

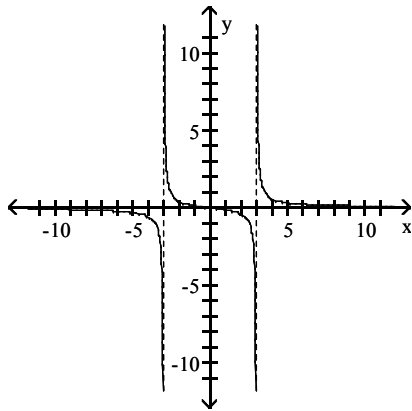


- A) domain: $\{x \mid x > 0\}$
 range: $\{y \mid y \neq 5\}$
 C) domain: $\{x \mid x \neq 5\}$
 range: $\{y \mid y > 0\}$

- B) domain: $\{x \mid x \neq 5\}$
 range: $\{y \mid y \geq 0\}$
 D) domain: $\{x \mid x \geq 0\}$
 range: $\{y \mid y \neq 5\}$

13) _____

14)



14) _____

- A) domain: $\{x \mid x \neq -3, x \neq 3\}$
 range: $\{y \mid y \neq 0\}$
 C) domain: all real numbers
 range: $\{y \mid y \neq -3, y \neq 3\}$

- B) domain: all real numbers
 range: all real numbers
 D) domain: $\{x \mid x \neq -3, x \neq 3\}$
 range: all real numbers

Find the vertical asymptotes of the rational function.

15) $g(x) = \frac{x+4}{x^2+4}$

15) _____

- A) $x = -2, x = 2$
 C) $x = -2, x = 2, x = -4$

- B) $x = -2, x = -4$
 D) none

16) $f(x) = \frac{x-3}{9x-x^3}$

16) _____

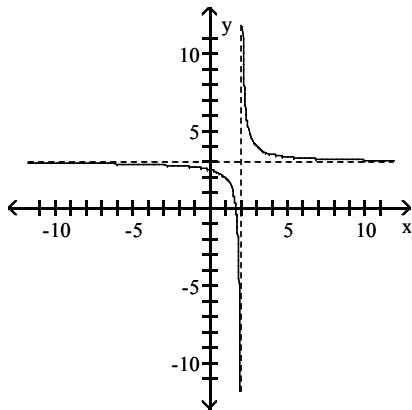
- A) $x = 0, x = -3, x = 3$
 C) $x = -3, x = 3$

- B) $x = 0, x = -3$
 D) $x = 0, x = 3$

Use the graph to find the vertical asymptotes, if any, of the function.

17)

17) _____



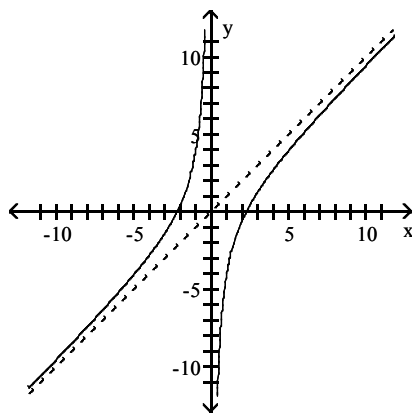
- A) $x = 2, x = 0$

- B) $x = 2, y = 3$

- C) $x = 2$

- D) $y = 3$

18)



A) $x = 0, y = 0$

B) $y = 0$

C) none

D) $x = 0$

18) _____

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

19) $h(x) = \frac{9x^2 - 7x - 5}{2x^2 - 2x + 9}$

A) $y = \frac{9}{2}$

B) $y = \frac{7}{2}$

C) $y = 0$

D) no horizontal asymptotes

19) _____

20) $f(x) = \frac{x + 8}{x^2 - 16}$

A) $y = 0$

B) $y = 1$

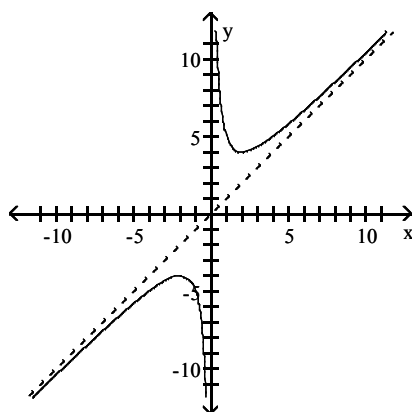
C) no horizontal asymptotes

D) $y = -4, y = 4$

20) _____

Use the graph to find the horizontal asymptote, if any, of the function.

21)



A) $y = 4$

B) none

C) $y = -4$

D) $y = 0$

21) _____

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

22) y-intercept of $f(x) = \frac{(5x - 10)(x - 3)}{x^2 + 6x - 19}$

A) $(0, 2)$

B) $(0, -\frac{30}{19})$

C) $(0, 3)$

D) $(0, \frac{30}{19})$

22) _____

Solve the problem.

23) A closed box with a square base has to have a volume of 19,000 cubic inches. Find a function for the surface area of the box. 23) _____

A) $S(x) = 2x^2 + \frac{19,000}{x}$

B) $S(x) = x^2 + \frac{76,000}{x}$

C) $S(x) = 2x^2 + \frac{76,000}{x}$

D) $S(x) = 2x^2 + \frac{114,000}{x}$

24) The revenue achieved by selling x graphing calculators is figured to be $x(31 - 0.5x)$ dollars. The cost of each calculator is \$11. How many graphing calculators must be sold to make a profit (revenue - cost) of at least \$187.50? 24) _____

A) $\{x \mid 17 < x < 23\}$

B) $\{x \mid 20 < x < 30\}$

C) $\{x \mid 16 < x < 24\}$

D) $\{x \mid 15 < x < 25\}$

Solve the inequality.

25) $(a + 5)(a - 2)(a - 4) > 0$ 25) _____

A) $(-\infty, 2)$

B) $(-5, 2)$ or $(4, \infty)$

C) $(4, \infty)$

D) $(-\infty, -5)$ or $(2, 4)$

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

26) $f(x) = x^4 + 8x^3 + 12x^2$; $x + 1$ 26) _____

A) $R = 5$

B) $R = -5$

C) $R = -21$

D) $R = 21$

27) $f(x) = 5x^6 - 3x^3 + 8$; $x + 1$ 27) _____

A) $R = 16$

B) $R = 6$

C) $R = 10$

D) $R = 8$

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

28) $f(x) = x^4 + 10x^3 + 4x^2 + 38x - 20$; $x + 10$ 28) _____

A) Yes

B) No

29) $f(x) = 4x^3 + 18x^2 - 9x + 5$; $x + 5$ 29) _____

A) Yes

B) No

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

30) $f(x) = 11x^3 - x^2 + 7$ 30) _____

A) $\pm \frac{1}{11}, \pm \frac{1}{7}, \pm 1, \pm 7, \pm 11$

B) $\pm \frac{1}{7}, \pm \frac{11}{7}, \pm 1, \pm 11$

C) $\pm \frac{1}{11}, \pm \frac{7}{11}, \pm 1, \pm 7, \pm 11$

D) $\pm \frac{1}{11}, \pm \frac{7}{11}, \pm 1, \pm 7$

31) $f(x) = 6x^4 + 2x^3 - 3x^2 + 2$ 31) _____

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

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

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

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

- 32) $f(x) = -4x^4 + 2x^2 - 4x + 6$ 32) _____
- A) $\pm \frac{1}{4}, \pm \frac{1}{2}, \pm \frac{2}{3}, \pm \frac{3}{4}, \pm \frac{3}{2}, \pm 1, \pm 2, \pm 3, \pm 6$ B) $\pm \frac{1}{6}, \pm \frac{1}{2}, \pm \frac{1}{3}, \pm \frac{2}{3}, \pm \frac{4}{3}, \pm 1, \pm 2, \pm 4$
- 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) $\pm \frac{1}{4}, \pm \frac{1}{2}, \pm \frac{3}{4}, \pm \frac{3}{2}, \pm 1, \pm 2, \pm 3, \pm 6$

- 33) $f(x) = 2x^5 - 2x^2 + 2x - 1$ 33) _____
- A) $\pm 1, \pm \frac{1}{2}$ B) $\pm 2, \pm \frac{1}{2}$ C) $\pm 1, \pm 2$ D) $\pm 1, \pm 2, \pm \frac{1}{2}$

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.

- 34) $f(x) = x^3 + 2x^2 - 5x - 6$ 34) _____
- A) -2, 1, 3; $f(x) = (x + 2)(x - 1)(x - 3)$ B) -3, -1, 2; $f(x) = (x + 3)(x + 1)(x - 2)$
- C) -1; $f(x) = (x + 1)(x^2 + x - 6)$ D) -3; $f(x) = (x + 3)(x^2 - x - 2)$
- 35) $f(x) = 2x^3 - 11x^2 + 7x + 20$ 35) _____
- A) -4, $\frac{5}{2}, 1$; $f(x) = (2x - 5)(x - 1)(x + 4)$ B) -1, $\frac{5}{2}, 4$; $f(x) = (2x - 5)(x - 4)(x + 1)$
- C) 1, $\frac{2}{5}, -4$; $f(x) = (2x - 5)(x - 1)(x + 4)$ D) -1, $\frac{2}{5}, -4$; $f(x) = (2x - 5)(x - 4)(x + 1)$

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-intercepts: -2, 2, 3; y-intercept: -12 D) x-intercept: -2; y-intercept: -12
- 37) $f(x) = 4x^3 - 23x^2 + 26x + 8$ 37) _____
- A) x-intercepts: $-\frac{1}{4}, 2, 4$; y-intercept: 8 B) x-intercepts: -1, -1, -2; y-intercept: 8
- C) x-intercepts: $\frac{1}{4}, 2, -4$; y-intercept: 8 D) x-intercepts: 1, -1, 2; y-intercept: 8

Solve the equation in the real number system.

- 38) $x^3 + 7x^2 - 16x + 18 = 0$ 38) _____
- A) {-9} B) {1} C) {-9, 9} D) {9}
- 39) $3x^3 - x^2 + 3x - 1 = 0$ 39) _____
- A) $\left\{-3, \frac{1}{3}, -1\right\}$ B) $\left\{-3, -\frac{1}{3}, -1\right\}$ C) $\left\{\frac{1}{3}\right\}$ D) $\left\{\frac{1}{3}, -1\right\}$

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

- 40) Degree 3; zeros: 5, $2 - i$ 40) _____
- A) $-2 + i$ B) $2 + i$ C) -5 D) no other zeros

- 41) Degree 4; zeros: $3 - 5i, 4i$ 41) _____
 A) $3 + 5i, -4i$ B) $3 + 5i, 4 - i$ C) $-3 + 5i, -4i$ D) $-3 - 5i, -4i$
- 42) Degree 3; zeros: $-5, 5 - 5i$ 42) _____
 A) $5 + 5i$ B) $5, 5 + 5i$ C) $5, -5 + 5i$ D) $-5 + 5i$
- 43) Degree 5; zeros: $5, 6 + 5i, -5i$ 43) _____
 A) $-5, 6 - 5i, 5i$ B) $-6 + 5i, 5i$ C) $6 - 5i, 5i$ D) $-6 - 5i, 5i$

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

- 44) Degree: 3; zeros: -3 and $3 - 2i$ 44) _____
 A) $f(x) = x^3 - 3x^2 + 5x - 52$ B) $f(x) = x^3 - 3x^2 - 5x + 39$
 C) $f(x) = x^3 - x^2 + 11x + 39$ D) $f(x) = x^3 - x^2 - 5x + 39$
- 45) Degree: 3; zeros: -2 and $3 + i$. 45) _____
 A) $f(x) = x^3 - 4x^2 - 2x + 20$ B) $f(x) = x^3 - 6x^2 - 10x + 20$
 C) $f(x) = x^3 - 4x^2 - 10x + 20$ D) $f(x) = x^3 - 8x^2 + 2x + 20$
- 46) Degree: 4; zeros: $4i$ and $-5i$ 46) _____
 A) $f(x) = x^4 + 41x^2 + 400$ B) $f(x) = x^4 + 41x^2 - 5x + 400$
 C) $f(x) = x^4 - 4x^3 + 41x^2 + 400$ D) $f(x) = x^4 - 5x^2 + 400$

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

- 47) $f(x) = x^4 - 21x^2 - 100$; zero: $-2i$ 47) _____
 A) $2i, 10i, -10i$ B) $2i, 10, -10$ C) $2i, 5, -5$ D) $2i, 5i, -5i$
- 48) $f(x) = x^3 + 3x^2 - 8x + 10$; zero: $1 + i$ 48) _____
 A) $1 - i, 5$ B) $1 - i, -5$ C) $-5, 5$ D) $1 - i, 5i$

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

- 49) $f(x) = x^3 + 10x^2 + 33x + 34$ 49) _____
 A) $f(x) = (x + 2)(x + 4 + i)(x + 4 - i)$ B) $f(x) = (x - 1)(x + 4 + i\sqrt{3})(x + 4 - i\sqrt{3})$
 C) $f(x) = (x + 2)(x + 4 + i)(x - 4 - i)$ D) $f(x) = (x + 1)(x + 4 + i\sqrt{3})(x - 2 - i\sqrt{3})$
- 50) $f(x) = x^4 + 25x^2 + 144$ 50) _____
 A) $f(x) = (x + 3i)^2(x + 4i)^2$ B) $f(x) = (x + 3i)(x - 3i)(x + 4i)(x - 4i)$
 C) $f(x) = (x + i)(x - i)(x + 12i)(x - 12i)$ D) $f(x) = (x + 3 + 4i)^2(x + 3 - 4i)^2$