

Name _____

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

Determine whether the relation represents a function. If it is a function, state the domain and range.

1) $\{(7.66, 11.76), (7.666, -11.8), (\frac{9}{7}, 0), (1.29, -7)\}$ 1) _____

A) function

domain: $\{7.66, 7.666, \frac{9}{7}, 1.29\}$

range: $\{11.76, -11.8, 0, -7\}$

B) function

domain: $\{11.76, -11.8, 0, -7\}$

range: $\{7.66, 7.666, \frac{9}{7}, 1.29\}$

C) not a function

Determine whether the equation defines y as a function of x .

2) $y = |x|$ 2) _____

A) function

B) not a function

Find the value for the function.

3) Find $f(-9)$ when $f(x) = |x| - 6$. 3) _____

A) -3

B) 3

C) -15

D) 15

4) Find $f(-x)$ when $f(x) = \frac{x}{x^2 + 3}$. 4) _____

A) $\frac{-x}{x^2 - 3}$

B) $\frac{-x}{-x^2 + 3}$

C) $\frac{x}{-x^2 + 3}$

D) $\frac{-x}{x^2 + 3}$

5) Find $f(2x)$ when $f(x) = \sqrt{7x^2 - 9x}$. 5) _____

A) $\sqrt{14x^2 - 18x}$

B) $2\sqrt{7x^2 - 9x}$

C) $\sqrt{14x^2 - 36x}$

D) $\sqrt{28x^2 - 18x}$

6) Find $f(x + h)$ when $f(x) = \frac{6x + 7}{5x + 4}$. 6) _____

A) $\frac{6x + 13h}{5x + 9h}$

B) $\frac{6x + 6h + 7}{5x + 4}$

C) $\frac{6x + 6h + 7}{5x + 5h + 4}$

D) $\frac{6x + 7h}{5x + 4h}$

Find the domain of the function.

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

A) $\{x \mid x > -3\}$

C) $\{x \mid x \neq -3\}$

B) $\{x \mid x \geq -3\}$

D) all real numbers

8) $g(x) = \frac{3x}{x^2 - 64}$

- A) $\{x \mid x > 64\}$
 C) $\{x \mid x \neq -8, 8\}$

- B) $\{x \mid x \neq 0\}$
 D) all real numbers

8) _____

9) $f(x) = \sqrt{10 - x}$

- A) $\{x \mid x \leq \sqrt{10}\}$

- B) $\{x \mid x \neq 10\}$

- C) $\{x \mid x \neq \sqrt{10}\}$

- D) $\{x \mid x \leq 10\}$

9) _____

10) $\frac{x}{\sqrt{x-2}}$

- A) $\{x \mid x \neq 2\}$
 C) $\{x \mid x \geq 2\}$

- B) $\{x \mid x > 2\}$
 D) all real numbers

10) _____

For the given functions f and g , find the requested function and state its domain.

11) $f(x) = \sqrt{x}$; $g(x) = 6x - 5$

Find $\frac{f}{g}$.

A) $(\frac{f}{g})(x) = \frac{6x-5}{\sqrt{x}}$; $\{x \mid x \geq 0\}$

B) $(\frac{f}{g})(x) = \frac{\sqrt{x}}{6x-5}$; $\{x \mid x \neq \frac{5}{6}\}$

C) $(\frac{f}{g})(x) = \frac{\sqrt{x}}{6x-5}$; $\{x \mid x \neq 0\}$

D) $(\frac{f}{g})(x) = \frac{\sqrt{x}}{6x-5}$; $\{x \mid x \geq 0, x \neq \frac{5}{6}\}$

11) _____

12) $f(x) = 5x^3 + 1$; $g(x) = 5x^2 + 3$

Find $f \cdot g$.

A) $(f \cdot g)(x) = 25x^5 + 15x^3 + 5x^2 + 3$; all real numbers

B) $(f \cdot g)(x) = 5x^3 + 5x^2 + 3$; all real numbers

C) $(f \cdot g)(x) = 25x^5 + 15x^3 + 5x^2 + 3$; $\{x \mid x \neq 0\}$

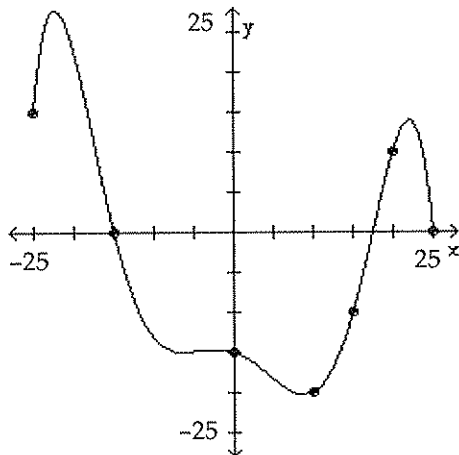
D) $(f \cdot g)(x) = 25x^6 + 15x^3 + 5x^2 + 3$; all real numbers

12) _____

The graph of a function f is given. Use the graph to answer the question.

13) Use the graph of f given below to find $f(25)$.

13) _____



A) 30

B) 50

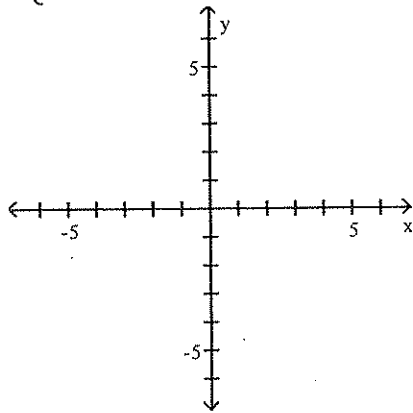
C) 25

D) 0

Graph the function.

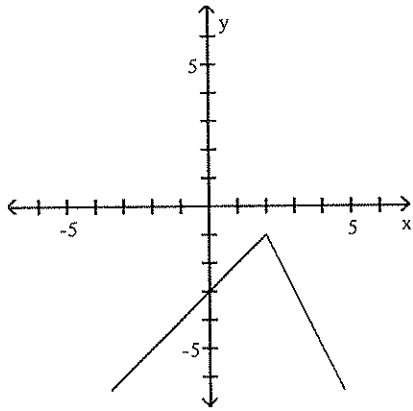
14)

$$f(x) = \begin{cases} -x + 3 & \text{if } x < 2 \\ 2x - 3 & \text{if } x \geq 2 \end{cases}$$

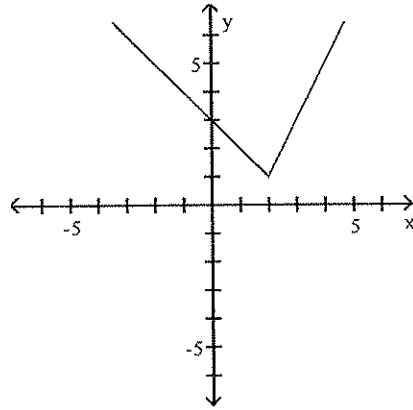


14) _____

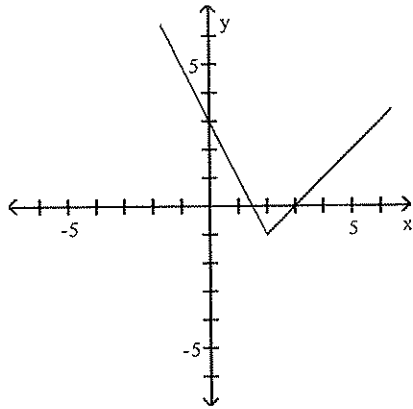
A)



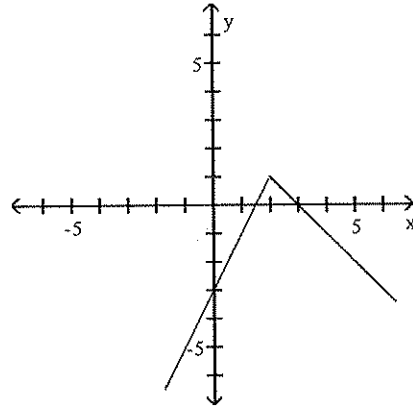
B)



C)



D)

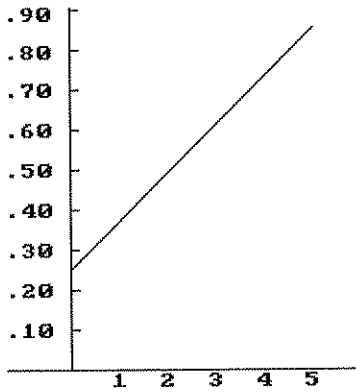


Solve the problem.

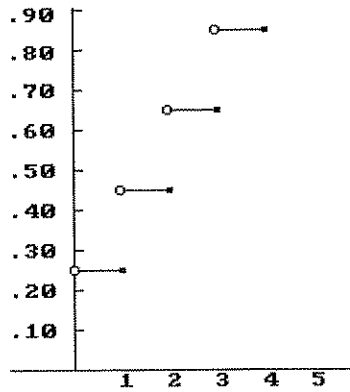
- 15) Assume it costs 25 cents to mail a letter weighing one ounce or less, and then 20 cents for each additional ounce or fraction of an ounce. Let $L(x)$ be the cost of mailing a letter weighing x ounces. Graph $y = L(x)$.

15) _____

A)



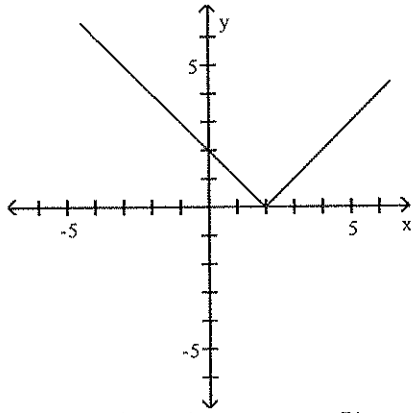
B)



Match the correct function to the graph.

16)

16) _____



A) $y = |1 - x|$

B) $y = x - 2$

C) $y = |2 - x|$

D) $y = |x + 2|$

Write an equation that results in the indicated translation.

- 17) The square root function, shifted 7 units downward

17) _____

A) $y = \sqrt{x} - 7$

B) $y = \sqrt{x + 7}$

C) $y = \sqrt{x} + 7$

D) $y = \sqrt{x - 7}$

Solve the problem.

- 18) Bob wants to fence in a rectangular garden in his yard. He has 88 feet of fencing to work with and wants to use it all. If the garden is to be x feet wide, express the area of the garden as a function of x .

18) _____

A) $A(x) = 43x - x^2$

B) $A(x) = 46x^2 - x$

C) $A(x) = 45x - x^2$

D) $A(x) = 44x - x^2$

Use a graphing utility to find the equation of the line of best fit. Round to two decimal places, if necessary.

19)
$$\begin{array}{r|rrrrr} x & 24 & 26 & 28 & 30 & 32 \\ y & 15 & 13 & 20 & 16 & 24 \end{array}$$

19) _____

A) $y = 1.05x + 11.8$

B) $y = 0.95x - 11.8$

C) $y = 1.05x - 11.8$

D) $y = 0.95x + 11.8$

Find the vertex and axis of symmetry of the graph of the function.

20) $f(x) = -7x^2 - 14x - 3$

A) $(1, -24)$; $x = 1$

C) $(-2, -17)$; $x = -2$

B) $(2, -59)$; $x = 2$

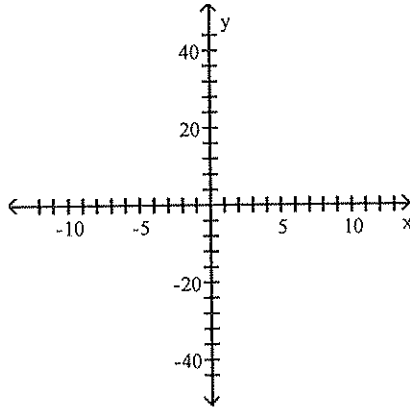
D) $(-1, 4)$; $x = -1$

20) _____

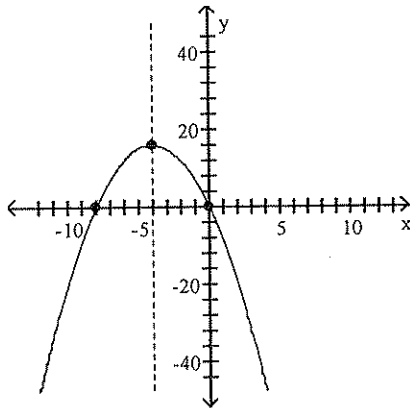
Graph the function using its vertex, axis of symmetry, and intercepts.

21) $f(x) = -x^2 + 8x$

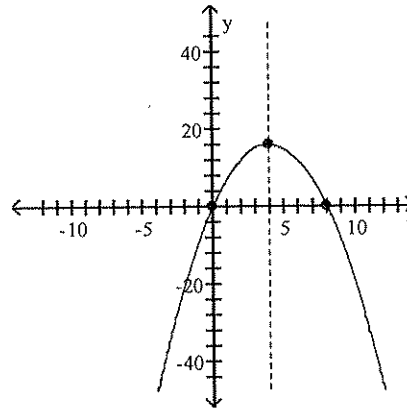
21) _____



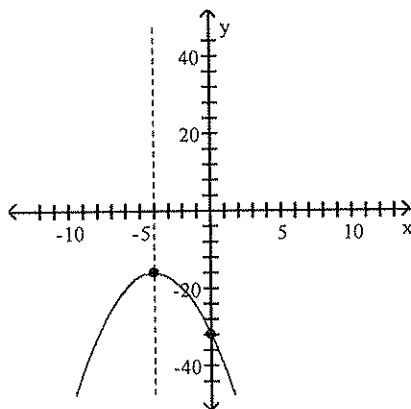
A) vertex $(-4, 16)$
intercepts $(0, 0)$, $(-8, 0)$



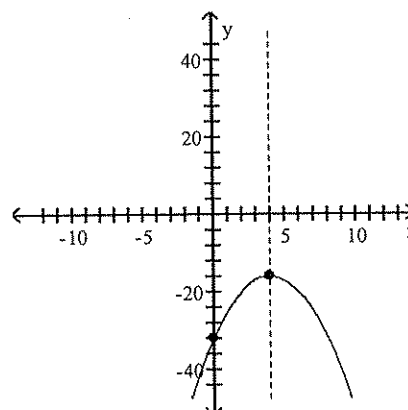
B) vertex $(4, 16)$
intercepts $(0, 0)$, $(8, 0)$



C) vertex $(-4, -16)$
intercept $(0, -32)$



D) vertex $(4, -16)$
intercept $(0, -32)$



Determine, without graphing, whether the given quadratic function has a maximum value or a minimum value and then find that value.

22) $f(x) = 4x^2 + 2x - 9$

22) _____

A) minimum; $-\frac{37}{4}$

B) maximum; $-\frac{1}{4}$

C) minimum; $-\frac{1}{4}$

D) maximum; $-\frac{37}{4}$

Solve the problem.

23) The manufacturer of a CD player has found that the revenue R (in dollars) is $R(p) = -5p^2 + 1730p$, when the unit price is p dollars. If the manufacturer sets the price p to maximize revenue, what is the maximum revenue to the nearest whole dollar?

23) _____

A) \$598,580

B) \$299,290

C) \$1,197,160

D) \$149,645

24) A developer wants to enclose a rectangular grassy lot that borders a city street for parking. If the developer has 312 feet of fencing and does not fence the side along the street, what is the largest area that can be enclosed?

24) _____

A) 18,252 ft²

B) 24,336 ft²

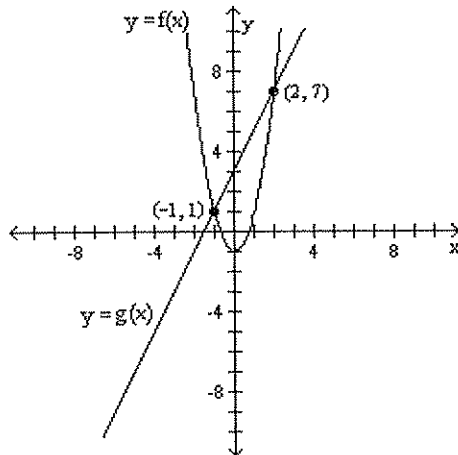
C) 12,168 ft²

D) 6084 ft²

Use the figure to solve the inequality.

25)

25) _____



$g(x) \geq f(x)$

A) $\{x \mid x < -1 \text{ or } x > 2\}; (-\infty, -1) \text{ or } (2, \infty)$

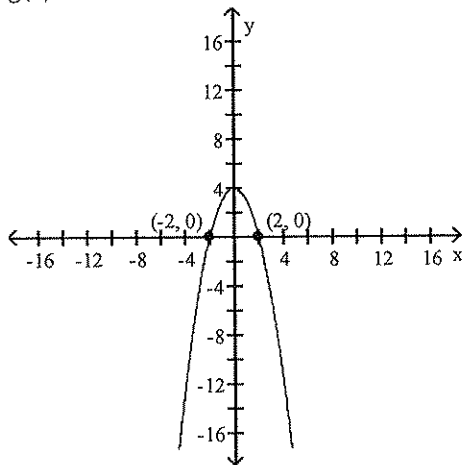
B) $\{x \mid -1 < x < 2\}; (-1, 2)$

C) $\{x \mid -1 \leq x \leq 2\}; [-1, 2]$

D) $\{x \mid x \leq -1 \text{ or } x \geq 2\}; (-\infty, -1] \text{ or } [2, \infty)$

26) $g(x) \leq 0$

26) _____



- A) $\{x \mid x \leq -2 \text{ or } x \geq 2\}; (-\infty, -2] \text{ or } [2, \infty)$
- C) $\{x \mid x < -2 \text{ or } x > 2\}; (-\infty, -2) \text{ or } (2, \infty)$

- B) $\{x \mid -2 \leq x \leq 2\}; [-2, 2]$
- D) $\{x \mid -2 < x < 2\}; (-2, 2)$

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

27) $f(x) = \frac{1 - x^5}{4}$

27) _____

- A) No; it is a ratio
- C) Yes; degree 5

- B) Yes; degree 1
- D) No; x is a negative term

28) $f(x) = 15$

28) _____

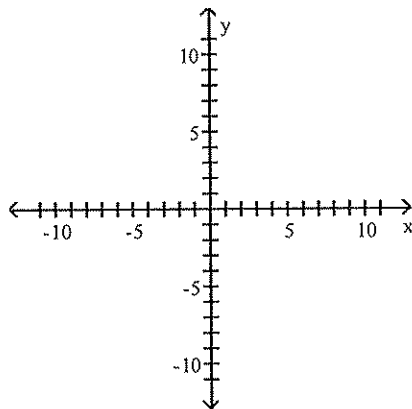
- A) Yes; degree 1
- C) Yes; degree 0

- B) No; it contains no variables
- D) No; it is a constant

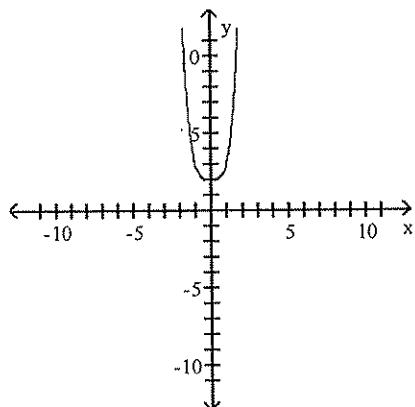
Use transformations of the graph of $y = x^4$ or $y = x^5$ to graph the function.

29) $f(x) = (x - 2)^4$

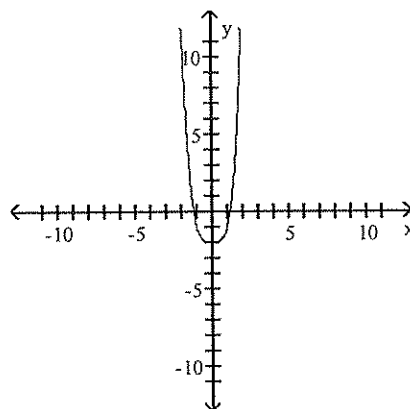
29) _____



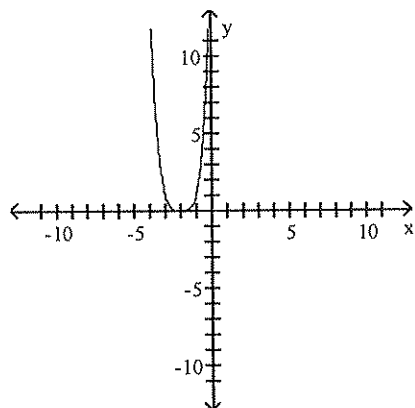
A)



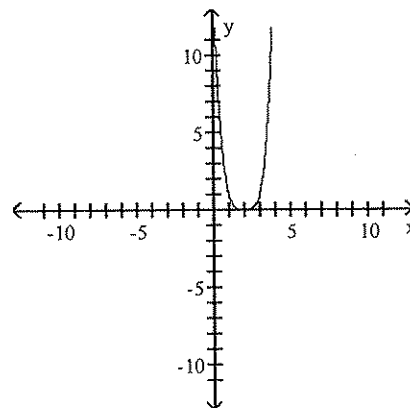
B)



C)



D)



Form a polynomial whose zeros and degree are given.

30) Zeros: $-1, 1, -9$; degree 3

A) $f(x) = x^3 + 9x^2 - x - 9$ for $a = 1$

B) $f(x) = x^3 + 9x^2 + x + 9$ for $a = 1$

C) $f(x) = x^3 - 9x^2 - x + 9$ for $a = 1$

D) $f(x) = x^3 - 9x^2 + x - 9$ for $a = 1$

30) _____

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

31) $f(x) = 4(x + 3)(x - 1)^3$

A) 3, multiplicity 1, crosses x -axis; -1 , multiplicity 3, crosses x -axis

B) -3 , multiplicity 1, crosses x -axis; 1 , multiplicity 3, crosses x -axis

C) -3 , multiplicity 1, touches x -axis; 1 , multiplicity 3

D) 3, multiplicity 1, touches x -axis; -1 , multiplicity 3

31) _____

32) $f(x) = 2(x^2 + 2)(x + 6)^2$

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

B) -6 , multiplicity 2, crosses x -axis

C) -2 , multiplicity 1, crosses x -axis; -6 , multiplicity 2, touches x -axis

D) -6 , multiplicity 2, touches x -axis

32) _____

Find the x - and y -intercepts of f .

33) $f(x) = (x - 4)(x - 2)$

A) x -intercepts: $-4, -2$; y -intercept: 8

B) x -intercepts: $4, 2$; y -intercept: 8

C) x -intercepts: $-4, -2$; y -intercept: -6

D) x -intercepts: $4, 2$; y -intercept: -6

33) _____

Determine the maximum number of turning points of f.

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

A) 2

B) 7

C) 6

D) 5

34) _____

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

35) $f(x) = (x + 7)^2$

A) $y = x^{14}$

B) $y = x^{49}$

C) $y = x^7$

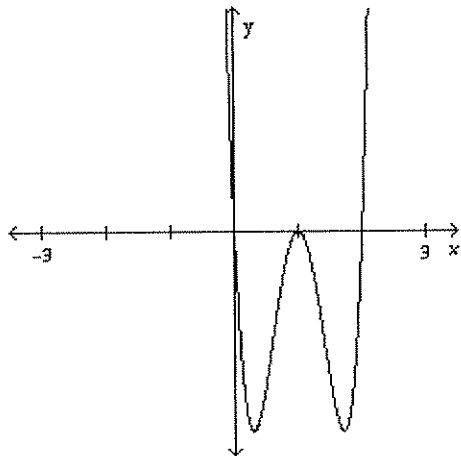
D) $y = x^2$

35) _____

Solve the problem.

36) Which of the following polynomial functions might have the graph shown in the illustration below?

36) _____



A) $f(x) = x^2(x - 2)(x - 1)$

C) $f(x) = x(x - 2)^2(x - 1)$

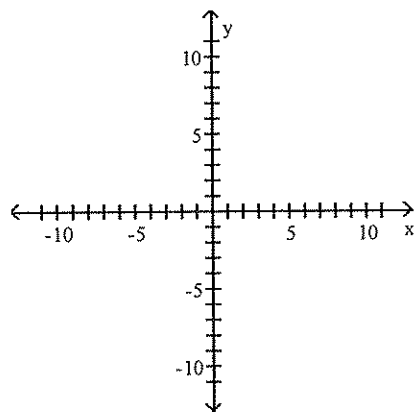
B) $f(x) = x^2(x - 2)^2(x - 1)^2$

D) $f(x) = x(x - 2)(x - 1)^2$

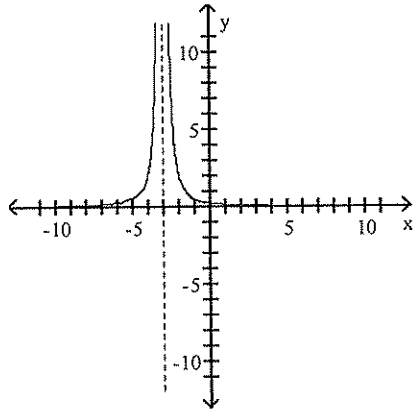
Graph the function using transformations.

37) $f(x) = \frac{2}{(3 + x)^2}$

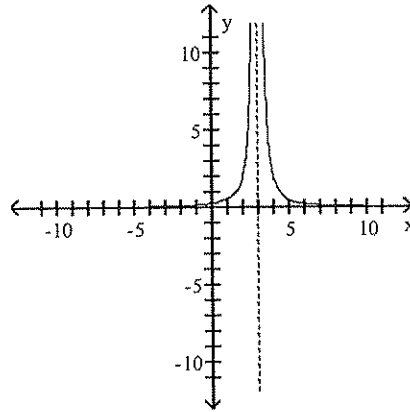
37) _____



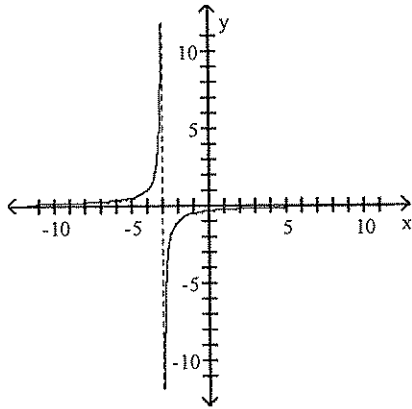
A)



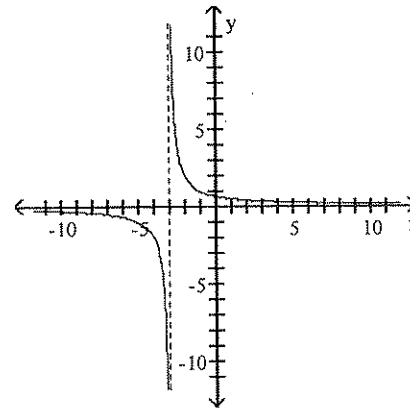
B)



C)



D)



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

38) $F(x) = \frac{x^2 - 4}{16x - x^4}$

38) _____

A) $y = 0$

B) $y = -1$

C) $y = -4, y = 4$

D) none

39) $Q(x) = \frac{-x^2 + 16}{x^2 + 5x + 4}$

39) _____

A) $y = 0$

B) $y = -1$

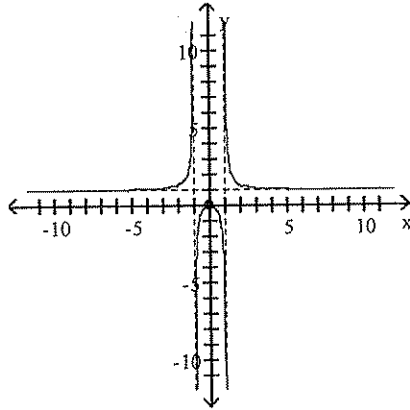
C) $y = -16$

D) none

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

40)

40) _____



A) $y = x$

B) $y = x + 1$

C) $y = 1$

D) none

Solve the problem.

41) The rational function

41) _____

$$C(x) = \frac{150x}{100 - x}, \quad 0 \leq x < 100$$

describes the cost, C , in millions of dollars, to inoculate $x\%$ of the population against a particular strain of the flu. Determine the difference in cost between inoculating 85% of the population and inoculating 50% of the population. (Round to the nearest tenth, if necessary.)

A) \$1.3 million

B) \$699.9 million

C) \$700.0 million

D) \$1.2 million

Find the domain of the rational function.

42) $f(x) = \frac{x + 5}{x^2 + 64x}$

42) _____

A) $\{x \mid x \neq -8, 8\}$

B) $\{x \mid x \neq 0, -64\}$

C) $\{x \mid x \neq -8, 8, -5\}$

D) all real numbers

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

43) x-intercepts of $f(x) = \frac{x^3 - 216}{x^2 - 25}$

43) _____

A) $(-6, 0), (6, 0)$

B) $(-216, 0)$

C) $(5, 0)$

D) $(6, 0)$

44) y-intercept of $f(x) = \frac{x^3 + 4}{x^2 + 2}$

44) _____

A) $(0, 4)$

B) $(0, 5)$

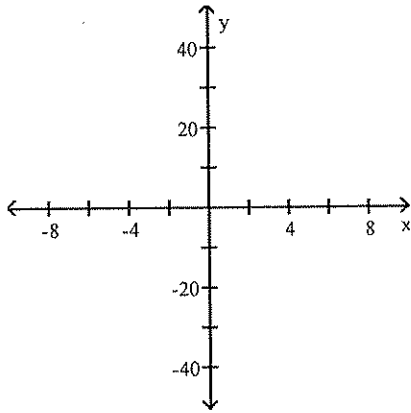
C) $(0, 2)$

D) none

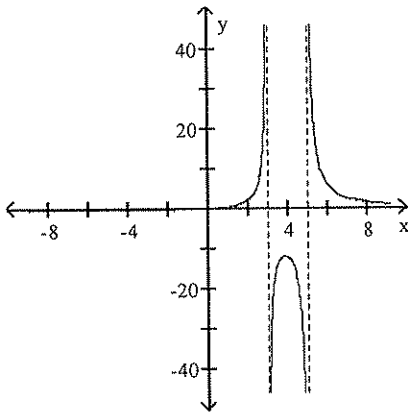
Graph the function.

45) $f(x) = \frac{3x}{(x+5)(x-3)}$

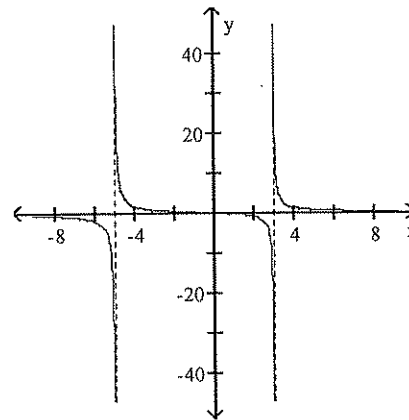
45) _____



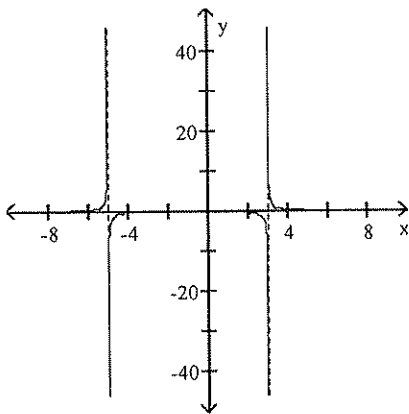
A)



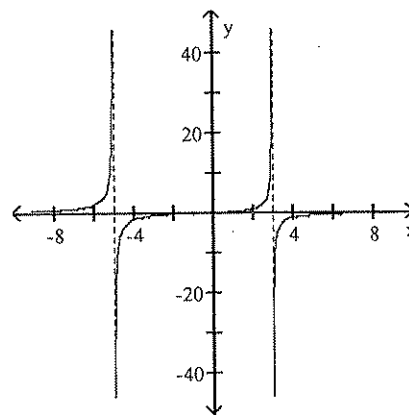
B)



C)



D)



Solve the problem.

46) A can in the shape of a right circular cylinder is required to have a volume of 700 cubic centimeters. The top and bottom are made up of a material that costs 8¢ per square centimeter, while the sides are made of material that costs 5¢ per square centimeter. Find a function that describes the total cost of the material as a function of the radius r of the cylinder.

46) _____

A) $C(r) = 0.16\pi r^2 + \frac{70}{r}$

B) $C(r) = 0.16\pi r^2 + \frac{140}{r}$

C) $C(r) = 0.08\pi r^2 + \frac{70}{r}$

D) $C(r) = 0.08\pi r^2 + \frac{140}{r}$

Solve the inequality. Express the solution using interval notation.

47) $\frac{x-8}{x+5} < 1$ 47) _____

- A) $(-5, \infty)$ B) $(-\infty, -5)$
 C) $(-\infty, -5)$ or $(8, \infty)$ D) $(-5, 8)$

48) $\frac{(x-6)(x+6)}{x} \leq 0$ 48) _____

- A) $[-6, 0)$ or $[6, \infty)$ B) $[-6, 0)$ or $(0, 6]$
 C) $(-\infty, -6]$ or $[6, \infty)$ D) $(-\infty, -6]$ or $(0, 6]$

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

49) $f(x) = x^4 + 8x^3 + 12x^2; x + 1$ 49) _____
 A) 21 B) -21 C) 5 D) -5

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

50) $5x^4 + 19x^3 - 4x^2 + x - 4; x + 4$ 50) _____
 A) Yes B) No

Give the maximum number of zeros the polynomial function may have. Use Descartes's Rule of Signs to determine how many positive and how many negative zeros it may have.

51) $f(x) = x^7 + x^6 + x^2 + x + 4$ 51) _____
 A) 7; 0 positive zeros; 1 negative zero B) 7; 0 positive zeros; 2 or 0 negative zeros
 C) 7; 0 positive zeros; 0 negative zeros D) 7; 0 positive zeros; 3 or 1 negative zeros

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

52) $f(x) = -4x^4 + 3x^2 - 2x + 6$ 52) _____
 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) $\pm \frac{1}{4}, \pm \frac{1}{2}, \pm \frac{3}{4}, \pm \frac{3}{2}, \pm 1, \pm 2, \pm 3, \pm 6$

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.

53) $f(x) = 4x^4 - 9x^3 + 25x^2 - 45x + 25$ 53) _____
 A) $1, \frac{5}{4}; f(x) = (x-1)(4x-5)(x^2+5)$
 B) $-5, -1, 1, -\frac{5}{4}; f(x) = (x-1)(4x+5)(x+1)(x+5)$
 C) $5, \frac{5}{4}; f(x) = (x-5)(4x-5)(x^2+1)$
 D) $-5, -1, 1, \frac{5}{4}; f(x) = (x-1)(4x-5)(x+1)(x+5)$

Solve the equation in the real number system.

54) $2x^3 - 11x^2 + 17x - 6 = 0$

A) $\left\{\frac{3}{2}, 1, 2\right\}$

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

C) $\left\{\frac{1}{2}, 2, 3\right\}$

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

54) _____

Use the Intermediate Value Theorem to determine whether the polynomial function has a zero in the given interval.

55) $f(x) = 3x^4 - 6x^2 - 5$; $[1, 2]$

A) $f(1) = 8$ and $f(2) = 20$; no

C) $f(1) = 8$ and $f(2) = -19$; yes

B) $f(1) = -8$ and $f(2) = 19$; yes

D) $f(1) = -8$ and $f(2) = -19$; no

55) _____

Answer Key

Testname: PROBS_EXAMIII

- 1) A
- 2) A
- 3) B
- 4) D
- 5) D
- 6) C
- 7) D
- 8) C
- 9) D
- 10) B
- 11) D
- 12) A
- 13) D
- 14) B
- 15) B
- 16) C
- 17) A
- 18) D
- 19) C
- 20) D
- 21) B
- 22) A
- 23) D
- 24) C
- 25) C
- 26) A
- 27) C
- 28) C
- 29) D
- 30) A
- 31) B
- 32) D
- 33) B
- 34) C
- 35) D
- 36) D
- 37) A
- 38) A
- 39) B
- 40) D
- 41) C
- 42) B
- 43) D
- 44) C
- 45) B
- 46) A
- 47) A
- 48) D
- 49) C
- 50) B

Answer Key

Testname: PROBS_EXAMII

- 51) D
- 52) D
- 53) A
- 54) C
- 55) B