

Name: _____

MATH 140- College Algebra
Review for Final Exam
FALL 2018

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

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

- 1) $f(x) = -x^2 + 10x + 4$ 1) _____
A) (5, 29) ; $x = 5$ B) (-5, -71) ; $x = -5$
C) (-5, -21) ; $x = -5$ D) (10, 4) ; $x = 10$

- 2) $f(x) = x^2 + 10x$ 2) _____
A) (25, -5) ; $x = 25$ B) (-5, -25) ; $x = -5$
C) (5, -25) ; $x = 5$ D) (-25, 5) ; $x = -25$

Solve the problem.

- 3) Elissa wants to set up a rectangular dog run in her backyard. She has 22 feet of fencing to work with and wants to use it all. If the dog run is to be x feet long, express the area of the dog run as a function of x . 3) _____
A) $A(x) = 11x - x^2$ B) $A(x) = 12x - x^2$ C) $A(x) = 10x - x^2$ D) $A(x) = 13x^2 - x$

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.

- 4) $f(x) = x^3 + 2x^2 - 5x - 6$ 4) _____
A) -3, -1, 2; $f(x) = (x + 3)(x + 1)(x - 2)$ B) -3; $f(x) = (x + 3)(x^2 - x - 2)$
C) -2, 1, 3; $f(x) = (x + 2)(x - 1)(x - 3)$ D) -1; $f(x) = (x + 1)(x^2 + x - 6)$

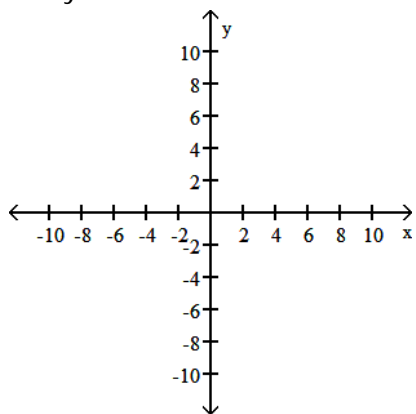
Determine algebraically whether the function is even, odd, or neither.

- 5) $f(x) = -7x^2 - 4$ 5) _____
A) even B) odd C) neither

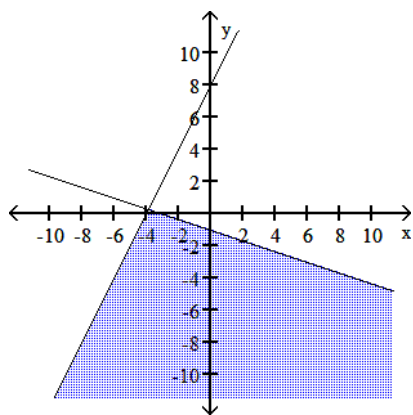
Graph the system of inequalities.

6) $2x - y \leq -8$
 $x + 3y \geq -3$

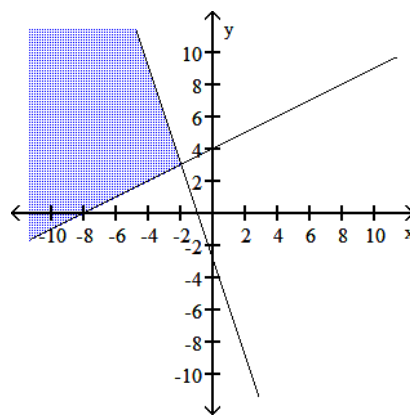
6) _____



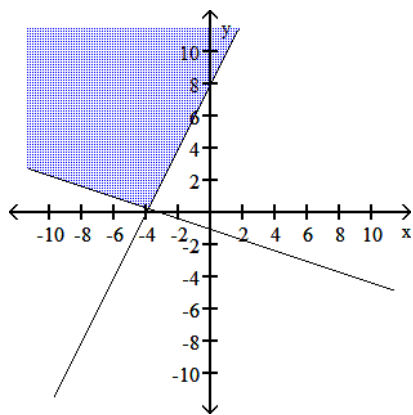
A)



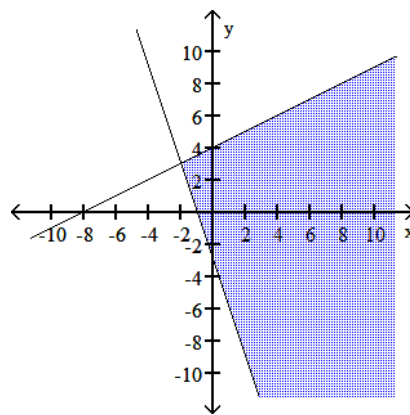
B)



C)

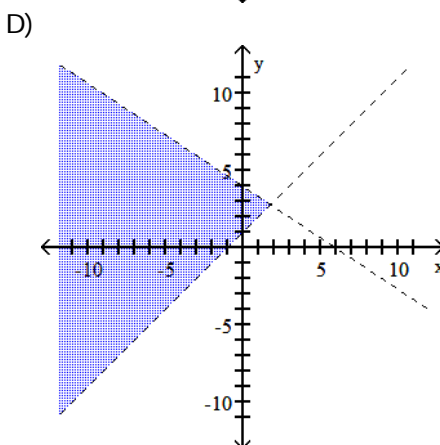
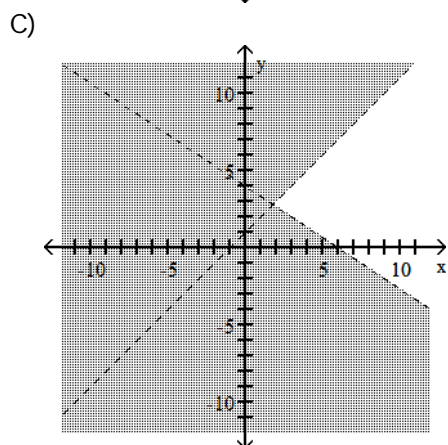
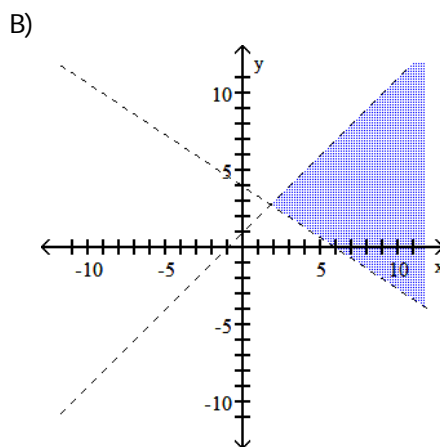
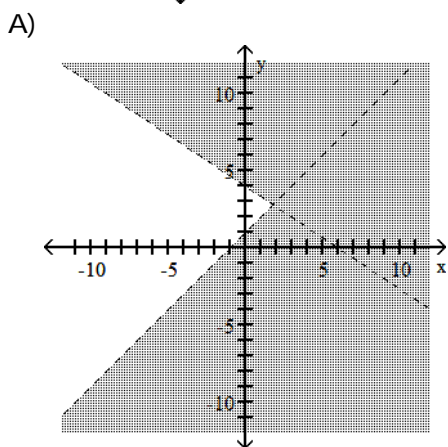
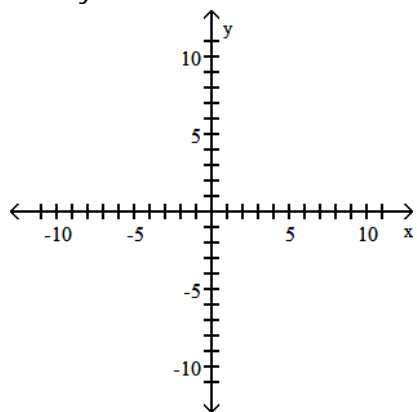


D)



7) $y < x + 1$
 $4x + 6y > 24$

7) _____



Solve the system of equations using substitution.

8)

8) _____

$$\begin{cases} x^2 + y^2 = 113 \\ x + y = 15 \end{cases}$$

A) $x = 8, y = 7$; $x = 7, y = 8$
 or $(8, 7), (7, 8)$

C) $x = -8, y = -7$; $x = -7, y = -8$
 or $(-8, -7), (-7, -8)$

B) $x = -8, y = 7$; $x = -7, y = 8$
 or $(-8, 7), (-7, 8)$

D) $x = 8, y = -7$; $x = 7, y = -8$
 or $(8, -7), (7, -8)$

Divide and simplify.

9) $\frac{5p - 5}{p} \div \frac{6p - 6}{5p^2}$

9) _____

A) $\frac{6}{25p}$

B) $\frac{25p^3 - 25p^2}{6p^2 - 6p}$

C) $\frac{30p^2 + 60p + 30}{5p^3}$

D) $\frac{25p}{6}$

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

10) $f(x) = \frac{3x^2 + 5}{3x^2 - 5}$

10) _____

A) $y = 5$

B) $y = 3$

C) $y = 1$

D) no horizontal asymptotes

Find the vertical asymptotes of the rational function.

11) $f(x) = \frac{3x}{x - 6}$

11) _____

A) $x = -6$

B) none

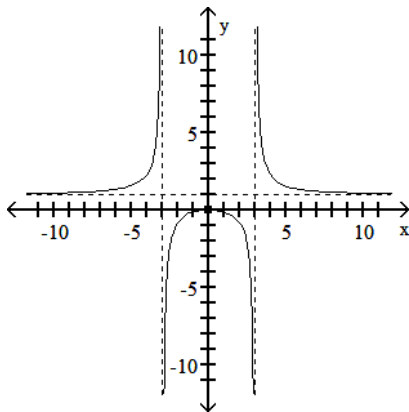
C) $x = 3$

D) $x = 6$

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

12)

12) _____



A) domain: $\{x \mid x \leq 0 \text{ or } x > 1\}$

range: $\{y \mid y \neq -3, y \neq 3\}$

C) domain: $\{x \mid x \neq -3, x \neq 3\}$

range: $\{y \mid y \leq 0 \text{ or } y \geq 1\}$

B) domain: all real numbers

range: all real numbers

D) domain: $\{x \mid x \neq -3, x \neq 3\}$

range: $\{y \mid y \leq 0 \text{ or } y > 1\}$

Solve the inequality.

13) $\frac{x - 4}{x + 9} < 1$

13) _____

A) $(-9, 4)$

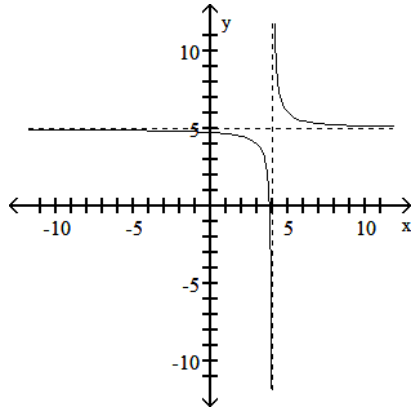
B) $(-\infty, -9) \text{ or } (4, \infty)$

C) $(-\infty, -9)$

D) $(-9, \infty)$

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

14)



14) _____

- A) domain: $\{x \mid x \neq -4\}$
 range: $\{y \mid y \neq 5\}$
 C) domain: $\{x \mid x \neq 5\}$
 range: $\{y \mid y \neq 4\}$

- B) domain: $\{x \mid x \neq 5\}$
 range: $\{y \mid y \neq -4\}$
 D) domain: $\{x \mid x \neq 4\}$
 range: $\{y \mid y \neq 5\}$

Solve the inequality.

15) $\frac{x-1}{x+4} > 0$

15) _____

- A) $(-\infty, -4)$
 C) $(-4, 1)$

- B) $(-\infty, -4)$ or $(1, \infty)$
 D) $(1, \infty)$

Use the properties of logarithms to find the exact value of the expression. Do not use a calculator.

16) $\log_4 4^{16}$

16) _____

- A) 64 B) 16 C) 4 D) 1

Find the domain of the rational function.

17) $f(x) = \frac{x(x-1)}{49x^2 + 42x + 5}$

17) _____

- A) $\left\{x \mid x \neq -\frac{1}{49}, -\frac{5}{49}\right\}$
 C) $\left\{x \mid x \neq -\frac{1}{7}, -\frac{5}{7}\right\}$

- B) $\left\{x \mid x \neq \frac{1}{7}, \frac{5}{7}\right\}$
 D) $\left\{x \mid x \neq -\frac{5}{49}, \frac{10}{49}\right\}$

Solve the equation.

18) $\log_3 x = 5$

18) _____

- A) $\{15\}$ B) $\{125\}$ C) $\{1.46\}$ D) $\{243\}$

Express as a single logarithm.

19) $2 \log_b 9 + 10 \log_b 6$

19) _____

- A) $\log_b 9^2 \cdot \log_b 6^{10}$ B) $\log_b \frac{9^2}{6^{10}}$
 C) $\log_b (18 + 60)$ D) $\log_b 9^2 6^{10}$

Write as the sum and/or difference of logarithms. Express powers as factors.

20) $\log_3 \left(\frac{x^2}{y^7} \right)$

20) _____

A) $2 \log_3 x - 7 \log_3 y$

B) $\frac{2}{7} \log_3 \left(\frac{x}{y} \right)$

C) $2 \log_3 x + 7 \log_3 y$

D) $7 \log_3 y - 2 \log_3 x$

Solve the equation.

21) $2(7 - 3x) = \frac{1}{4}$

21) _____

A) {3}

B) {-3}

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

D) {1}

Find the amount that results from the investment.

22) \$1,000 invested at 11% compounded annually after a period of 3 years

22) _____

A) \$367.63

B) \$1367.63

C) \$1518.07

D) \$1232.10

For the given functions f and g, find the requested composite function.

23) $f(x) = \frac{4}{x-4}$, $g(x) = \frac{7}{5x}$; Find $(f \circ g)(x)$.

23) _____

A) $\frac{4x}{7-20x}$

B) $\frac{20x}{7+20x}$

C) $\frac{20x}{7-20x}$

D) $\frac{7x-28}{20x}$

Evaluate.

24) Find $(f+g)(-3)$ when $f(x) = x-5$ and $g(x) = x+3$.

24) _____

A) -14

B) -8

C) -4

D) 2

25) Find $(f-g)(-3)$ when $f(x) = 3x^2 - 6$ and $g(x) = x+3$.

25) _____

A) 21

B) 27

C) 15

D) -18

26) Find $\left(\frac{f}{g} \right)(-3)$ when $f(x) = 2x-5$ and $g(x) = 5x^2 + 14x + 2$.

26) _____

A) $-\frac{11}{5}$

B) 5

C) $\frac{2}{5}$

D) 1

27) Find $(fg)(-4)$ when $f(x) = x+3$ and $g(x) = 4x^2 + 12x + 2$.

27) _____

A) -18

B) -126

C) -462

D) 30

Solve the equation.

28) $5^x = 625$

28) _____

A) {125}

B) {5}

C) {4}

D) {3}

For the given functions f and g, find the requested composite function.

29) $f(x) = \sqrt{x+6}$, $g(x) = 8x-10$; Find $(f \circ g)(x)$.

29) _____

A) $8\sqrt{x+6} - 10$

B) $2\sqrt{2x-1}$

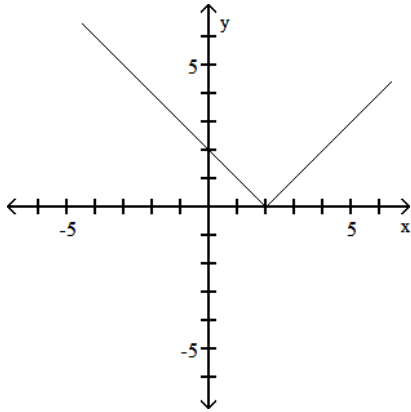
C) $8\sqrt{x-4}$

D) $2\sqrt{2x+1}$

Match the correct function to the graph.

30)

30) _____



A) $y = |x + 2|$

B) $y = x - 2$

C) $y = |2 - x|$

D) $y = |1 - x|$

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

31) $\{(9.33, 13.93), (9.333, -13.9), (\frac{2}{7}, 0), (0.29, -9)\}$

31) _____

A) function

domain: $\{13.93, -13.9, 0, -9\}$

range: $\{9.33, 9.333, \frac{2}{7}, 0.29\}$

B) function

domain: $\{9.33, 9.333, \frac{2}{7}, 0.29\}$

range: $\{13.93, -13.9, 0, -9\}$

C) not a function

Write the equation of a sine function that has the given characteristics.

32) The graph of $y = \sqrt{x}$, shifted 9 units to the right

32) _____

A) $y = \sqrt{x} - 9$

B) $y = \sqrt{x + 9}$

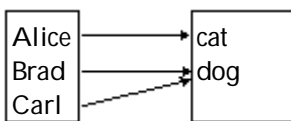
C) $y = \sqrt{x} + 9$

D) $y = \sqrt{x - 9}$

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

33)

33) _____



A) function

domain: $\{cat, dog\}$

range: $\{Alice, Brad, Carl\}$

B) function

domain: $\{Alice, Brad, Carl\}$

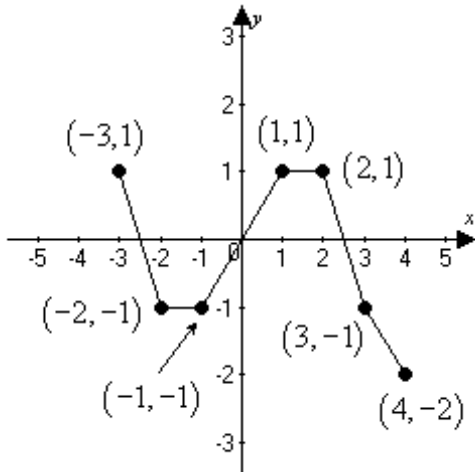
range: $\{cat, dog\}$

C) not a function

Use the graph to find the intervals on which it is increasing, decreasing, or constant.

34)

34) _____

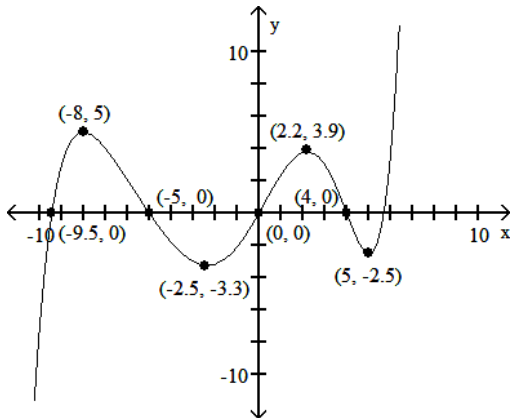


- A) Decreasing on $(-3, -2)$ and $(2, 4)$; increasing on $(-1, 1)$
- B) Increasing on $(-3, -2)$ and $(2, 4)$; decreasing on $(-1, 1)$; constant on $(-2, -1)$ and $(1, 2)$
- C) Decreasing on $(-3, -2)$ and $(2, 4)$; increasing on $(-1, 1)$; constant on $(-2, -1)$ and $(1, 2)$
- D) Decreasing on $(-3, -1)$ and $(1, 4)$; increasing on $(-2, 1)$

The graph of a function is given. Determine whether the function is increasing, decreasing, or constant on the given interval.

35) $(-\infty, -8)$

35) _____



- A) decreasing
- B) constant
- C) increasing

Find the domain of the function.

36) $\frac{x}{\sqrt{x-5}}$

36) _____

- A) $\{x \mid x \neq 5\}$
- B) $\{x \mid x > 5\}$
- C) all real numbers
- D) $\{x \mid x \geq 5\}$

Indicate whether the function is one-to-one.

37) $\{(-13, -20), (-10, -20), (13, -8)\}$

37) _____

- A) Yes
- B) No

Solve the equation.

38) $\log(x + 2) = \log(5x - 3)$

A) $\left\{-\frac{1}{4}\right\}$

B) $\left\{\frac{5}{4}\right\}$

C) $\left\{-\frac{5}{4}\right\}$

D) $\left\{\frac{5}{3}\right\}$

38) _____

Solve the problem.

39) Find the amount owed at the end of 8 years if \$5000 is loaned at a rate of 5% compounded monthly.

A) \$9093.60

B) \$8060.16

C) \$12,911.25

D) \$7452.93

39) _____

Find the exact value of the logarithmic expression.

40) $\log_4 \frac{1}{64}$

A) $\frac{1}{3}$

B) -3

C) $-\frac{1}{3}$

D) 3

40) _____

The function f is one-to-one. Find its inverse.

41) $f(x) = 2x$

A) $f^{-1}(x) = \frac{2}{x}$

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

C) $f^{-1}(x) = \frac{x}{2}$

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

41) _____

42) $f(x) = 6x + 4$

A) $f^{-1}(x) = \frac{x + 4}{6}$

B) $f^{-1}(x) = \frac{x - 4}{6}$

C) $f^{-1}(x) = \frac{x}{6} + 4$

D) $f^{-1}(x) = \frac{x}{6} - 4$

42) _____

Find the domain of the function.

43) $f(x) = x^2 + 4$

A) $\{x \mid x \geq -4\}$

B) $\{x \mid x > -4\}$

C) $\{x \mid x \neq -4\}$

D) all real numbers

43) _____

Find the inverse of the function and state its domain and range .

44) $\{(2, -9), (9, -2), (1, 4), (-1, -4)\}$

A) $\{(-4, 1), (-2, 9), (-9, 9), (4, -1)\}; D = \{-4, -2, -9, 4\}; R = \{1, 9, -1\}$

B) $\left\{\left(2, -\frac{1}{9}\right), \left(9, -\frac{1}{2}\right), \left(1, \frac{1}{4}\right), \left(-1, -\frac{1}{4}\right)\right\}; D = \{2, 9, 1, -1\}; R = \left\{-\frac{1}{9}, -\frac{1}{2}, \frac{1}{4}, -\frac{1}{4}\right\}$

C) $\{(-9, 2), (-2, 9), (4, 1), (-4, -1)\}; D = \{-9, -2, 4, -4\}; R = \{2, 9, 1, -1\}$

D) $\{(-4, 1), (1, 9), (-9, 2), (4, -1)\}; D = \{-4, 1, -9, 4\}; R = \{1, 9, 2, -1\}$

44) _____

Change the logarithmic expression to an equivalent expression involving an exponent.

45) $\log_{1/3} 81 = -4$

A) $(-4)^{1/3} = 81$

B) $\left(\frac{1}{3}\right)^{-4} = 81$

C) $81^{1/3} = 4$

D) $\left(\frac{1}{3}\right)^4 = 81$

45) _____

Change the exponential expression to an equivalent expression involving a logarithm.

46) $e^x = 7$

A) $\log_7 x = e$

B) $\log_x e = 7$

C) $\ln 7 = x$

D) $\ln x = 7$

46) _____

Divide and simplify.

47) $\frac{4x^2 - 49}{x^2 - 36} \div \frac{2x - 7}{x - 6}$

47) _____

A) $\frac{2x + 7}{x + 6}$

B) $\frac{(2x - 7)(4x^2 - 49)}{(x^2 - 6)(x - 6)}$

C) $\frac{2x - 7}{x - 6}$

D) $\frac{x + 6}{2x + 7}$

Change the exponential expression to an equivalent expression involving a logarithm.

48) $5^2 = 25$

48) _____

A) $\log_5 25 = 2$

B) $\log_2 25 = 5$

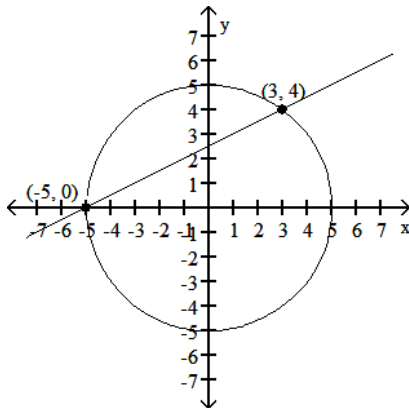
C) $\log_5 2 = 25$

D) $\log_{25} 5 = 2$

The graph of two equations along with the points of intersection are given. Substitute the points of intersection into the systems of equations. Are the points of intersection solutions to the system of equations (Y/N)?

49)

49) _____



$$\begin{cases} x^2 + y^2 = 25 \\ 2y + x = 5 \end{cases}$$

A) Yes

B) No

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.

50) $f(x) = x^4 - 16x^2 - 225$

50) _____

A) -5, 5; $f(x) = (x - 5)(x + 5)(x^2 + 9)$

B) 5; $f(x) = (x - 5)^2(x^2 + 9)$

C) -5, -3, 5, 3; $f(x) = (x - 5)(x + 5)(x - 3)(x + 3)$

D) -3, 3; $f(x) = (x - 3)(x + 3)(x^2 + 25)$

Solve the system of equations using Cramer's Rule if it is applicable. If Cramer's Rule is not applicable, say so.

51) $\begin{cases} 5x + 2y = -17 \\ 5x + y = -21 \end{cases}$

51) _____

A) $x = -4, y = -5; (-4, -5)$

B) $x = 5, y = -4; (5, -4)$

C) $x = 4, y = -5; (4, -5)$

D) $x = -5, y = 4; (-5, 4)$

52)
$$\begin{cases} 4x + 6z = 50 \\ 3x + 7y + 5z = 96 \\ -7x - 3y = -59 \end{cases}$$
 52) _____

A) $x = 5, y = 8, z = 5; (5, 8, 5)$ B) $x = 8, y = 5, z = 8; (8, 5, 8)$
 C) $x = 6, y = 6, z = 5; (6, 6, 5)$ D) $x = 5, y = -8, z = -5; (5, -8, -5)$

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

53) $f(x) = 6x^4 + 2x^3 - 3x^2 + 2$ 53) _____

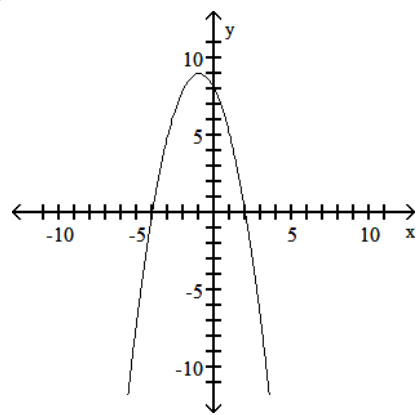
A) $\pm \frac{1}{2}, \pm \frac{3}{2}, \pm 1, \pm 2, \pm 3, \pm 6$ B) $\pm \frac{1}{6}, \pm \frac{1}{3}, \pm \frac{1}{2}, \pm \frac{2}{3}, \pm 1, \pm 2$
 C) $\pm \frac{1}{6}, \pm \frac{1}{3}, \pm \frac{1}{2}, \pm \frac{2}{3}, \pm 1, \pm 2, \pm 3$ D) $\pm \frac{1}{6}, \pm \frac{1}{3}, \pm \frac{1}{2},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

54) $f(x) = -2x^3 + 3x^2 - 4x + 8$ 54) _____

A) $\pm \frac{1}{4}, \pm \frac{1}{2}, \pm 1, \pm 2, \pm 4, \pm 8$ B) $\pm \frac{1}{2}, \pm 1, \pm 2, \pm 4$
 C) $\pm \frac{1}{2}, \pm 1, \pm 2, \pm 4, \pm 8$ D) $\pm \frac{1}{8}, \pm \frac{1}{4}, \pm \frac{1}{2}, \pm 1, \pm 2, \pm 4, \pm 8$

Determine the quadratic function whose graph is given.

55) 55) _____



Vertex: $(-1, 9)$
 y-intercept: $(0, 8)$

- A) $f(x) = -x^2 - 2x + 8$ B) $f(x) = x^2 - 4x + 8$
 C) $f(x) = -x^2 - 4x + 8$ D) $f(x) = -x^2 - 2x - 8$