Name _____ Period _____ Date _____

MIDTERM REVIEW

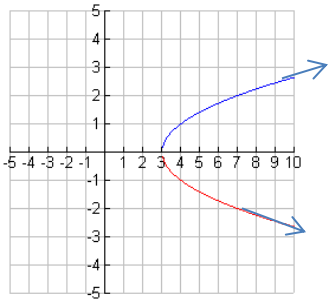
Algebra 31

Functions

1. What is the definition of a function?

2. How can you determine whether a GRAPH is a function?

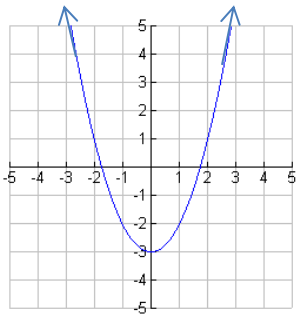
State whether the following examples are functions. Then state the domain and range. Use interval notation.

3. 

Function:

Domain:

Range:

4.) 

Function:

Domain:

Range:

5. $y = \sqrt{x - 12}$

Domain:

Range:

6. $y = \frac{1}{2x+3}$

Domain:

Range:

7. $y = -2x^2 + 6x - 25$

Domain:

Range:

For the problems below, refer to f(x), g(x) and m(x).

$f(x) = 3x^2 - 13$ $g(x) = 6x + 4$ $m(x) = x^2 + 7x$

8. *f(5)*

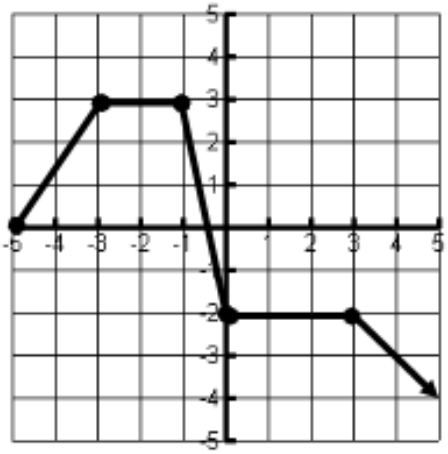
9. *m(x) = -12*

10. *g(x – 7)*

11. *f(x)= 14*

12. *g[f(x)]*

13. *m[g(x)] =*

14. 

a.) f(2) =

b.) f(x) = -2

c.) f(-3) =

d.) f(x) = 3

e.) f (0) =

Domain: Range:

Increasing:

Decreasing:

Constant:

15. For *a-f*, transform each graph.

a) f(x) + 2

b) f(x – 3)

c) f(x) – 1

d) – f(x)

e) f(x + 1) – 3

f) -f(x)+2

g) State the domain:

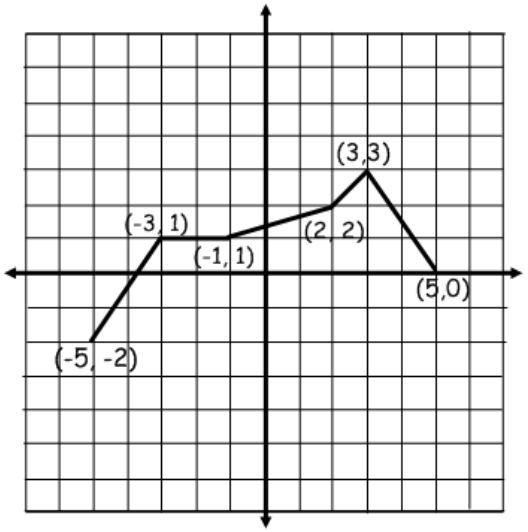
h) State the range:

i) Determine: f(3)

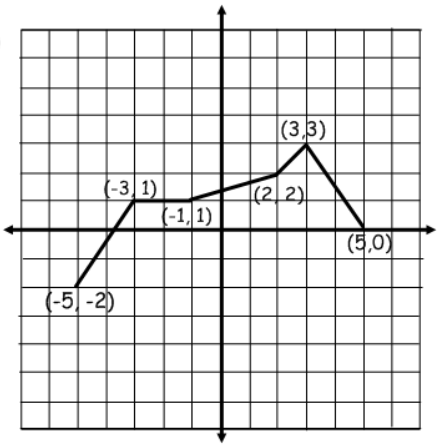
f(-5)

f(x) = 1

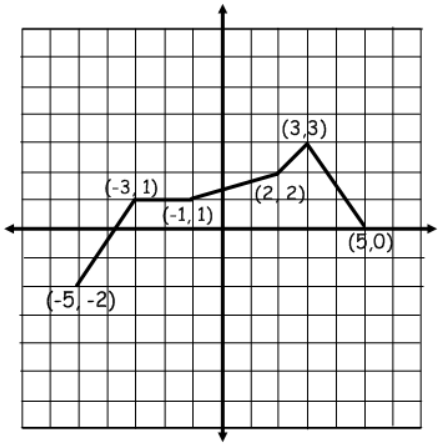
f(x)



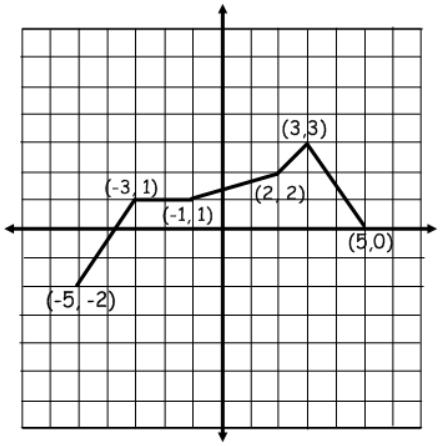
a.)



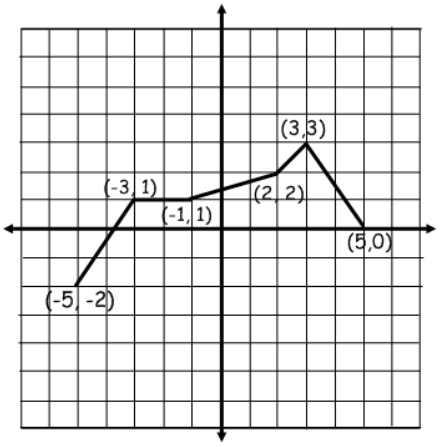
b.)



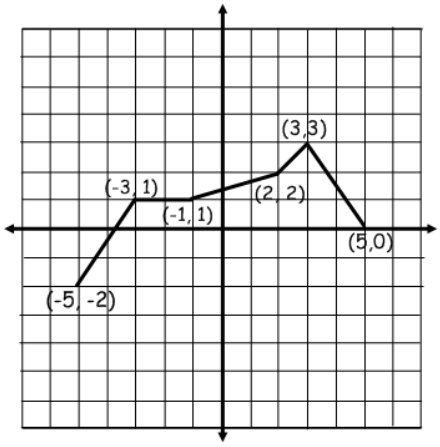
c.)



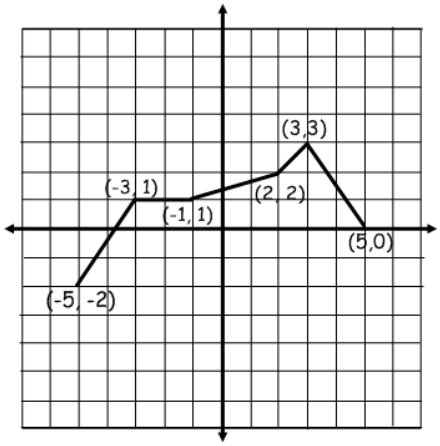
d.)



e.)



f.)



Solve:

16. Grover's Grocery Store has found that the profit, (P) from selling one type of canned soup depends on the price (x). From sales data, the model is $P(x) = -100(x-1.5)^2 + 95$. Determine the following:

a. P ($0.50) _____ b. P(x) = 70 _____

17. Given f(x) = ½ x - 4, find:

a) f(2) b) f(-4) c) f(0) d) f(6)

e) f(x) = 12 f) f(x) = - 4 g) f(x) = 3 h) f(x) = -10

18. Given $f(x) = 2x^2 + 11x - 11$, find:

a) f(- 3)

b) f(4)

c) f(0)

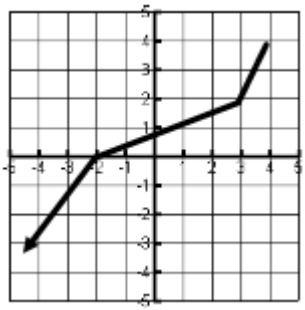
d) d) f(5)

e) f(x) = -25

f) f(x) = -23

State whether the following examples are functions. If it is, state the domain and range.

19.



Function?

Domain: _____

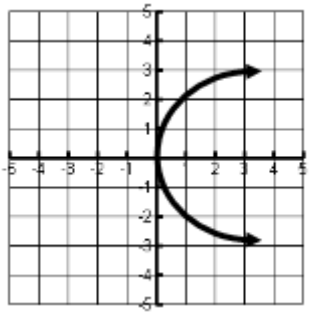
Range: _____

Increasing: _____

Decreasing: _____

Constant: _____

20.



Function?

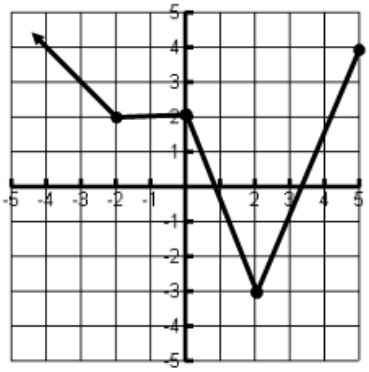
Domain: _____

Range: _____

Increasing: _____

Decreasing : _____

Constant: _____

21. 

a.) f(-2) =

b.) f (4) =

c.) f(x) = 0

d.) f(x) = 4

e.) f(x) = - 4

f.) f(2) =

Domain: _____

Range: _____

Perform the operation:

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

$$g(x) = x^2 + 4$$

$$k(x) = 2x - 7$$

22. *f (5)=*

23. *g(b +2)=*

24. *k[f (-1)] =*

25. *f (0) =*

26. *g[k(x)]*

27. *k[k(10)] =*

28. Transformations. Describe in words what each transformation does.

f(x – 2) f(x + 4) f(x) – 5

_____ _____ _____

f(-x) f(x) + 1 - f(x)

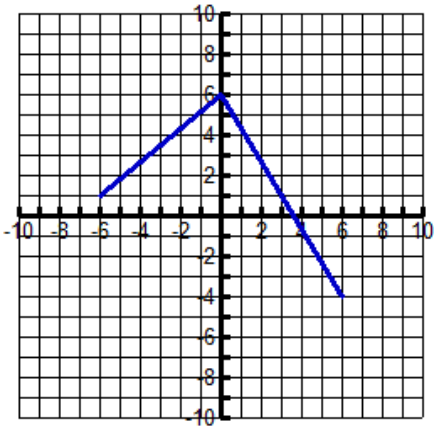
_____ _____ _____

2f(x) ½ f(x) f(x – 3)

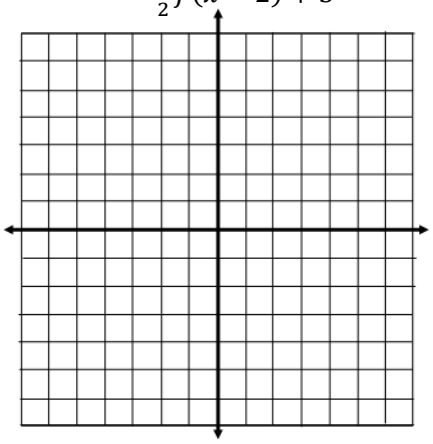
_____ _____ _____

29. Transform the graph.

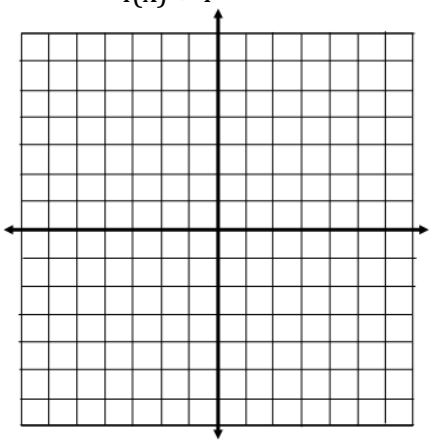
f(x)



$-\frac{1}{2}f(x-2)+3$



- f(x) + 4

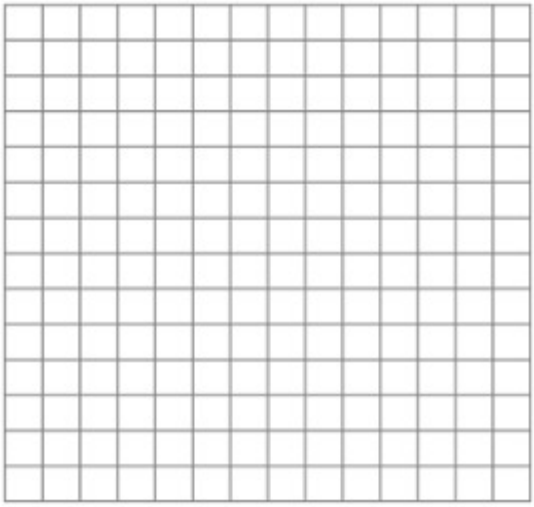


30. An American student studying abroad in Sevilla, Spain can get a cell phone through her University for $11 per month for 140 minutes or less of use. The student is charged $0.25 per minute over 140.

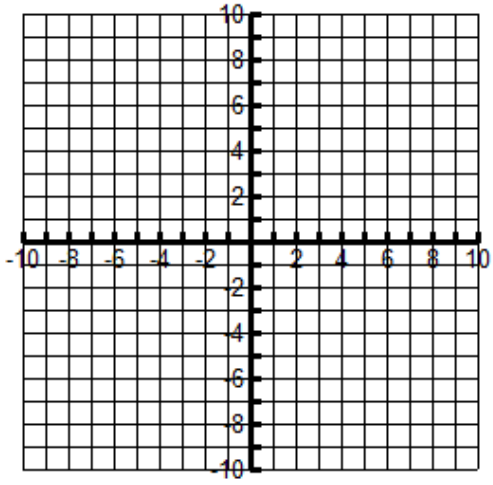
a. Determine a piece-wise function, *C(m)*, for the month cell phone bill.

b. How long did she talk on the phone if her bill was $35?

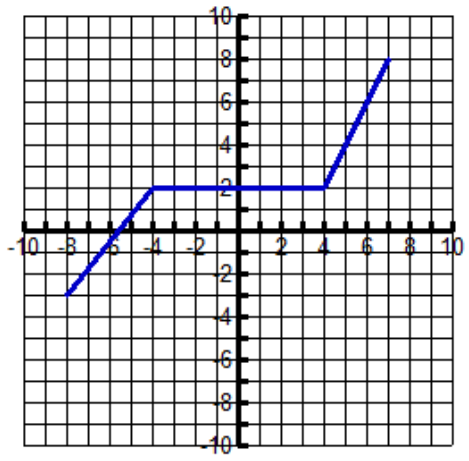
c. Sketch a graph of the piecewise function.



31. What is the inverse of $y = -3x + 9$? Graph both the original function and its inverse.



32. Write the piecewise function that is demonstrated by the graph.



Chapter 5

Perform the indicated operation.

1. $(2x^4+9x-9)-(x^4-2x^2+4x-8)$

2. $(x^4-x^3+x^2-x+1)+(x+x^4-1-x^2)$

3. $(x^2-6y)(x^2+6y)$

4. $(w+4)(w^2+6w-11)$

5. $(x-2)^3$

6. (x +4) (x – 6) (x – 5)

7. $(8x - 2)(8x + 2)$

8. $(3x + 4)^2$

9. The storage space in a moving truck is shaped like a rectangular prism. It has a total volume of 16 cubic meters. The height and width are both 2 meters less than the depth. What are the dimensions of the storage space?

Factor the following expressions completely.

10. $x^3 + 5x^2 + 4x + 20$

11. $2x^3 - 54$

12. $5x^3 - 20x^2 - 25x$

13. $x^4 - 2x^2 - 24$

14. $8y^4 - 18$

15. $x^3 - 4x^2 + 4x$

16. $x^3 + 3x^2 + x + 3$

17. $8x^3 - 27$

18. $x^4 + 7x^2 + 10$

19. $m^3 + 6m^2 - 4m - 24$

Solve by factoring. Find all real solutions.

20. $4x^3 + 16x^2 - 9x - 36 = 0$

21. $x^3 - 27 = 0$

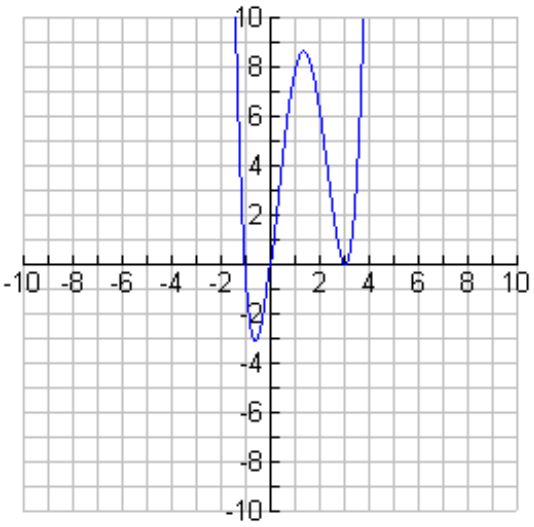
22. $x^3 + 5x^2 - x - 5 = 0$

23. $3x^4 + 30x^2 - 72 = 0$

24. $s^4 + 5s^2 - 6 = 0$

25. A rectangular shipping container has a volume of 96 m^3. The container is 8m taller than it is wide and its length is 2m less than it is wide. What are the dimensions of the container?

27. Find the zeros of the following function.



28. Factor completely.

Factoring cubes: $(a - b)(a^2 + ab + b^2)$

a. $x^3 + 5x^2 + 4x + 20$

b. $x^3 - 27$

c. $4x^3 - 10x^2 - 24x$

d. $x^4 - 6x^2 + 8$

29. Divide using long division. SHOW WORK! $(x^3 - 4x^2 - 2x + 3) \div (x + 1)$

30. Find **all** zeros of the polynomial function. $f(x) = x^4 + 4x^3 + 7x^2 + 16x + 12$

31. Write a polynomial function in STANDARD FORM of least degree that has rational coefficients, a leading coefficient of 1, and the given zeros. Given zeros: 2, 4i

32. If $2 + 3i$ is a solution to a polynomial, then what else is a solution to the same polynomial?
Write an equation with a leading coefficient of 1 with the 2 + 3i and the other zero that needs to be in the same polynomial.

33. Identify the number of solutions or zeros. $y = 2x^5 - 7x^3 - x^2 + x - 4$

34. Write a polynomial function in STANDARD FORM of least degree that has rational coefficients, a leading coefficient of 1, and the given zeros. -1, 3i

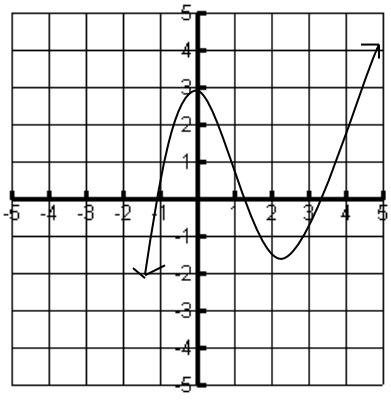
35. Find all zeros of the polynomial function. $f(x) = x^3 - 8x^2 + 11x + 20$

36. Find **all** zeros of the polynomial function. $f(x) = x^4 + x^3 + 2x^2 + 4x - 8$

37. Write a polynomial function in STANDARD FORM of least degree that has rational coefficients, a leading coefficient of 1, and the given zeros. -4, (3 + i), (3 – i)

38. What is true about the polynomial function whose graph is shown?

(Circle all that apply)



a) $f(x) \to -\infty \; as \; x \to +\infty$

b) $f(x) \to +\infty \; as \; x \to -\infty$

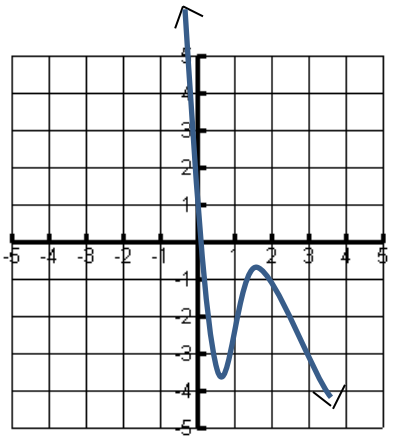
c) Leading coefficient is positive

d) Degree is even

e) Leading coefficient is negative

f) Degree is odd

39. Which equation is the graph of the polynomial function shown?



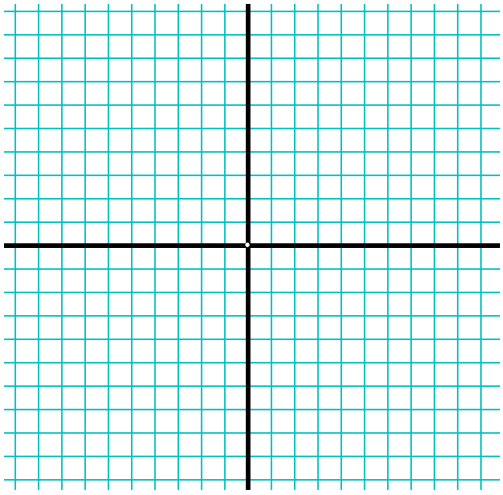
a) $f(x) = 3x^4 - x^2 + 2$

b) $f(x) = 3x^3 - x + 7$

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

d) $f(x) = -2x^3 + x^2 + 2$

40. Graph the polynomial function using a table of values. Use x = -3,-2,-1,0,1,2, 3.



$f(x) = x^3 - 5x$

X	Y

Factor the polynomial completely using any method.

41. $4x^3 + 16x^2 - 9x - 36$

42. $3x^3 - 81$

Find the *real-number* solutions of the equation.

43. $3n^5 + 15n = 18n^3$

44. A wooden board is shaped like a rectangular prism. It has a total volume of 324 cubic inches. The width is 3 inches less than the height and the length is 12 inches longer than the height. What are the dimensions of the board?

What are the dimensions? _____

45. Factor completely.

a. $m^3 + 6m^2 - 4m - 24$

b. $x^4 + 7x^2 + 10$

_____ _____

46. Divide the polynomials using long division.

$(8x^4 + 2x^2 - 12x + 9) \div (x^2 + x - 3)$

47. Solve by factoring.

$4x^3 + 16x^2 - 9x - 36 = 0$

48. Find *all* zeros of the polynomial functions.

$f(x) = 2x^4 - 2x^3 - 3x^2 - 7x + 10$

49. Write a polynomial function of least degree that has rational coefficients, a leading coefficient of 1, and the zeros are -1 and $3 + 2i$.

_____

50. Graph the function using your graphing calculator. (CALCULATOR!)

a) Find all the local maximums and minimums. Round to the nearest hundredth.
b) Estimate the zeros
c) Justify the amount of zeros you have on the graph. Explain why you can or cannot view all the zeros on the calculator.

$$f(x) = x^6 - 2x^5 + 3x^4 - 10x^3 - 6x^2 - 8x - 8$$

_____

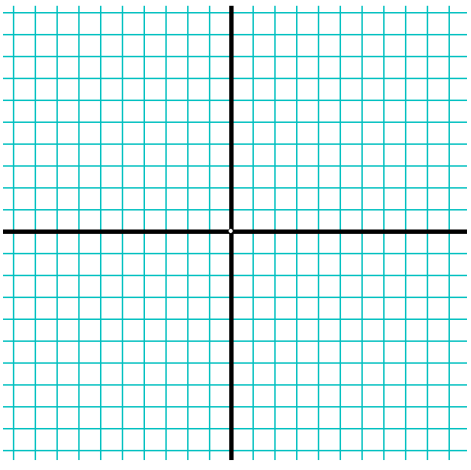
51. Divide the polynomials using long and synthetic division.

$(3x^4 + 2x^2 - 12x + 9) \quad \div \quad (x - 2)$

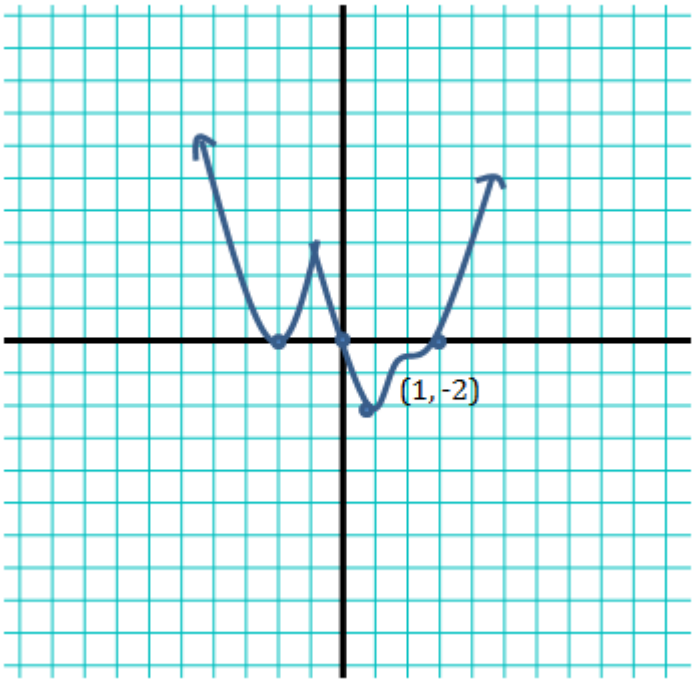
52. Write a polynomial function of least degree that has rational coefficients, a leading coefficient of 1, and the zeros are 6 and $1 - \sqrt{3}$.

53. Sketch the function.

$f(x) = -(x-4)^2(x+3)^3(x-1)(x+7)$



54. Write the equation in factored form whose graph is shown below.



Show work:

Equation: _____Domain: _____Range: _____

55. Graph the function using your graphing calculator. Round to the nearest hundredth. (CALCULATOR)

$f(x) = 3x^3 + 10x^2 - 23x + 7$

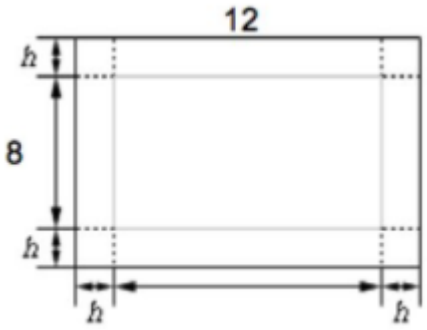
a) Find x-intercepts: _____

b) Find the coordinate point of the local maximum(s): _____

c) Find the coordinate point of the local minimum(s)points: _____

56. List the potential zeros for the function: $f(x) = 2x^3 + 7x - 12$

57. You are making a rectangular box out of an 8 x 12 inch piece of cardboard. The box will be formed by making the cuts shown in the diagram and folding up the sides. You want the box to have the greatest volume possible.



a. How long should you make the cuts?

b. What is the maximum volume?

c. What will the dimensions of the finished box be?

a. _____

b. _____

c. _____

CHAPTER 6 (5.1)

Rewrite the expression using radical notation.

1. $(-2)^{\frac{1}{5}}$ 2. $(2/3)^{\frac{1}{2}}$ 3. $(xy)^{\frac{7}{5}}$ 4. $(-3)^{\frac{2}{3}}$

Evaluate the expression without using a calculator.

5. $(16)^{\frac{3}{4}}$ 6. $\left(\sqrt[3]{-64}\right)^2$ 7. $(-1000)^{\frac{2}{3}}$ 8. $\left(\sqrt{25}\right)^2$

Evaluate the expression without using a calculator.

9. $(81)^{\frac{3}{4}}$ 10. $\left(\sqrt[3]{-27}\right)^2$

11. $(16)^{\frac{-3}{4}}$ 12. $\left(\sqrt[3]{-1000}\right)^2$

13. $\sqrt[3]{27} \cdot \sqrt[3]{81}$

14. $\sqrt[4]{32} \cdot \sqrt[4]{24}$

15. $-2(2x + 3)^3 = 54$

16. $2x^3 + 20 = 36$

17. $x^5 - 36 = -4$

18. $24 + (x + 6)^4 = 25$

Simplify the expression. Assume all variables are positive. No rational exponents or radicals can be left in the denominator.

19. $\sqrt{\frac{32x^5}{27x^3}}$

20. $\left(\frac{6f^{11/3}}{3f^{7/3}}\right)$

21. $\sqrt[3]{(3x^3)^2(3y^2)^5}$

22. $\sqrt[3]{(4xy^2)^2(2x^3y^2)^5}$

23. $\left(\left(\frac{2x^{11/6}}{x^{4/3}}\right)^2\right)^3$

24. $\sqrt{\frac{16y^8}{3y^3}}$

Perform the indicated operation.

25. $2\sqrt[4]{xy} - 5\sqrt[4]{xy}$

26. $3\sqrt[5]{64} - 8\sqrt[5]{2}$

27. $xy\sqrt[4]{48xy^4} - 5x\sqrt[4]{y^8 3x}$

28. $y^3\sqrt[5]{32x^4} - 7\sqrt[5]{x^4y^{15}}$

29. $12\sqrt[3]{2z^5} - z\sqrt[3]{54z^2}$

30. $\sqrt[5]{\frac{x^{10}}{y^5}}$

31. $\frac{6xy^{3/4}}{3x^{1/2}y^{1/2}}$

32. $\sqrt{9w^5} - w\sqrt{w^3}$

33. $\frac{3}{\sqrt[4]{144}}$

Calculator Section Problems

Evaluate the expression using a calculator. Round the result to the nearest hundredth where appropriate.

1. $(-23)^{-2/5}$

2. $\sqrt[5]{-116}$

3. $(-13)^{-2/5}$

4. $\sqrt[5]{-146}$

Solve the equation. Round the result to two decimal places when appropriate. Show all steps algebraically.

5. $x^4 + 9 = 36$

6. $12 - (2x + 3)^3 = 54$

Solve the equation. Round the result to the nearest hundredth where appropriate. Show all steps algebraically.

7. $x^3 + 3 = 67$

8. $4 + (3x + 1)^4 = 20$

Rewrite the expression using radical notation. (Non-Calculator Problems)

9. $(-3)^{\frac{3}{7}}$

10. $(-13)^{\frac{4}{5}}$

_____

_____

Evaluate the expression without using a calculator.

11. $(16)^{\frac{5}{4}}$

12. $\left(\sqrt[3]{-64}\right)^2$

_____

_____

13. $\left(\sqrt[3]{-27}\right)^2$

14. $(81)^{\frac{3}{4}}$

_____

_____

Simplify the expression. Assume all variables are positive.

15. $\left(\frac{5^{2/3}.y^{9/6}}{5^{5/12}.y^{2/3}}\right)$

16. $\sqrt[4]{(3x^2yz)^4\,(5zx^3)^2}$

Simplify the expression. Assume all variables are positive.

17. $\sqrt[4]{(2x^2y)^3(2xy^3)^2}$

18. $\left(\frac{7^{1/6}.x^{7/6}}{7^{1/12}.x^{2/3}}\right)$

Perform the indicated operation. Assume all variables are positive.

19. $2x\sqrt[4]{x^4yz^5} + \sqrt[4]{x^8yz^5}$

20. $5x\sqrt[3]{x^4yz^5} + \sqrt[3]{x^7yz^5}$

Solve the equations. Check for extraneous solutions.

21. $(2x+3)^{3/2} = 27$

22. $\sqrt{x+10} = x-2$

23. $(3x^2-2)^{1/2} + 4 = 9$

24. $\sqrt{3x+7} = x+1$

25. Solve the equation using algebra and check for extraneous solutions. Show all work algebraically.

$\sqrt{2x+3} + 2 = \sqrt{6x+7}$

Calculator Section. Round all answers to two decimal places if necessary.

26. Solve the equation by graphing on the calculator. $\sqrt[3]{{}^{2}/_{3}\,x-1}=\sqrt{x}-5$

27. Solve the equation by graphing on the calculator. (No algebra required)

$$\sqrt[3]{{}^{7}/_{8}\,x-9}=-\sqrt{x}+\ 3$$

Simplify the expression.

28. $\frac{e^{-4}(9e^{2})^{2}}{3}$

29. $\sqrt[3]{16e^{21x}}$

30. $\frac{1}{3}e^{-2}(6e^{3})^{2}$

31. $\sqrt[3]{24e^{13x}}$