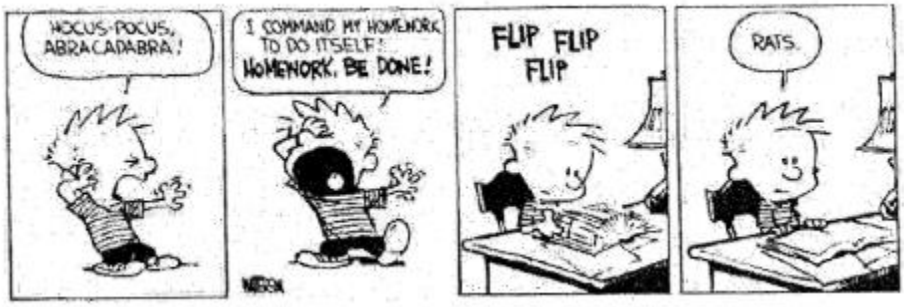
SUMMER MATH PACKET

(For students who have taken Algebra II)



Helpful Websites: If you need help with any of the problems, refer to the following websites:

www.glencoe.com

www.wolffamalpha.com

www.regentsprep.org

www.purplemath.comm

www.aleks.com

www.khanacademy.org

www.google.com

www.youtube.com

PART 1

Define the following.

1. integer

2. rational numbers

3. irrational numbers

4. domain

5. range

6. interval

7. linear

8. absolute value

9. conjugate

10. function

11. independent

12. dependent

13. polynomial

14. parabola

15. vertex

16. vertical asymptote

17. horizontal asymptote

18. maximum and minimum points

19. roots, zeros, x-intercepts, solutions

20. axis of symmetry

21. continuous function

22. inverse

23. transformations

24. significant figures

Everything you need to know about Linear Functions

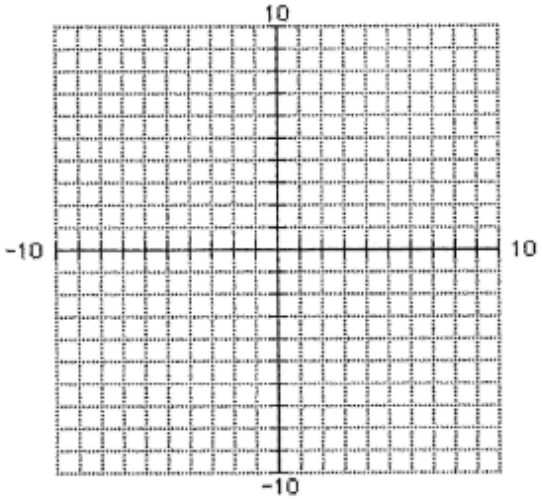
1. What is the Standard Form of a Linear Equation? _____

2. What is Slope-Intercept Form of a Linear Equation? _____

3. What is Point-Slope Form of a Linear Equation? _____

Graphing Linear Equations

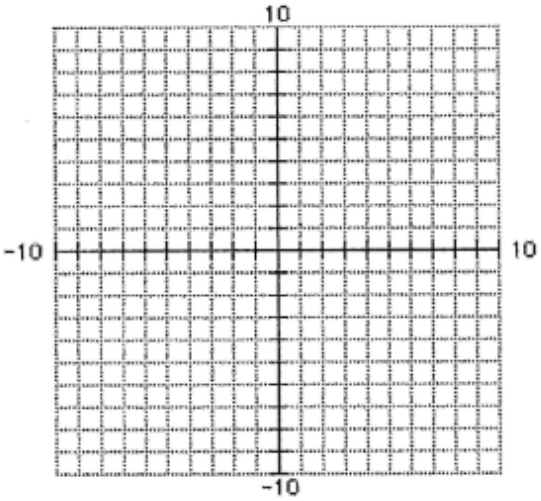
4. Graph the Linear Parent Function:
_____ in red and the function $y = \frac{2}{3}x - 6$
in pencil.



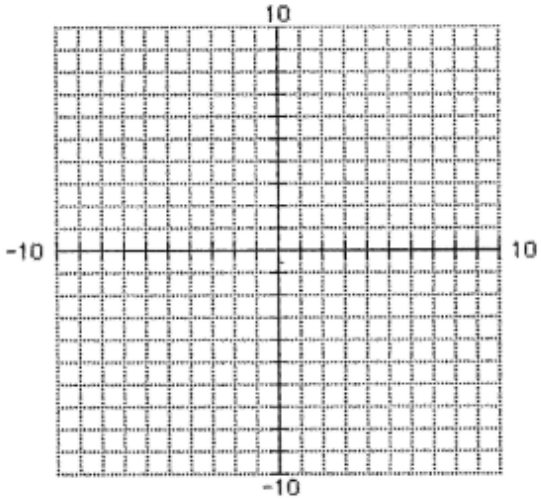
5. Identify the domain and range of both functions.

Parent: _____	$y = \frac{2}{3}x - 6$
Domain: _____	Domain: _____
Range: _____	Range: _____

6. Graph $5x + 2y = 10$



7. Graph $2x - y = 5$

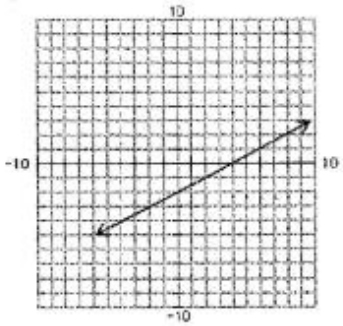


8. Parallel Lines have _____ slope.

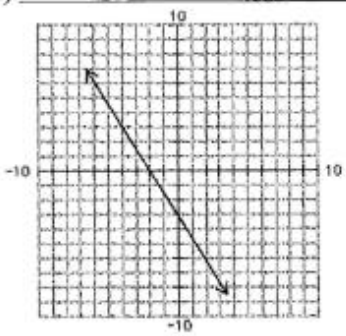
9. Perpendicular Lines have _____ slope.

10. Write the equation of each line in Slope -Intercept Form.

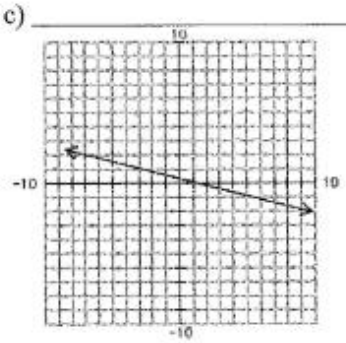
a) _____



b) _____



c) _____



11. Find the slope-intercept form of the line that passes through (2, 3) and (1, 5).

12. Write the standard form of the equation of the line that passes through (3, 2) and is parallel to the line whose equation is $y = 2x + 5$.

13. Write the standard form of the equation of the line that passes through (3, 2) and is perpendicular to the line whose equation is $y = 2x + 5$.

Everything you need to know about Quadratic Functions

14. What is the Standard Form of a Quadratic Equation? _____

15. What is General (Vertex) Form of a Quadratic Equation? _____

Graphing Quadratic Equations

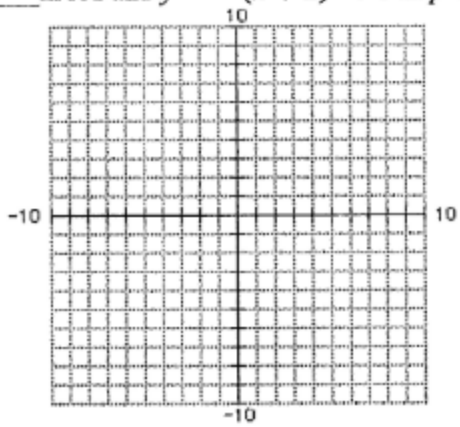
16. Graph the Quadratic Parent Function: _____ in red and $y = -(x+2)^2 + 3$ in pencil.

17. Identify the domain and range of both functions.

Parent: _____ $y = -(x+2)^2 + 3$

Domain: _____ Domain: _____

Range: _____ Range: _____



18. Graph the equation $y = 4(x+2)^2 - 3$

Identify the following parts of the parabola.

Vertex: _____

Axis of Symmetry: _____

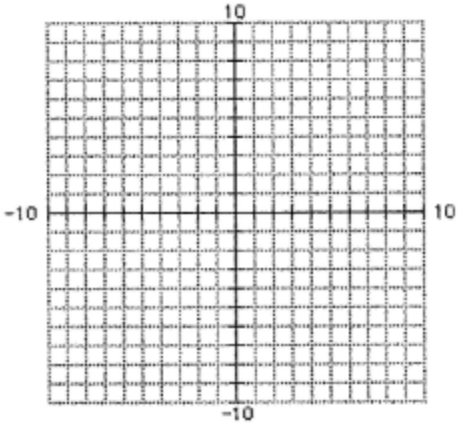
Direction: _____

x-intercepts: _____

x-intercepts: _____

Domain: _____

Range: _____



18. Graph the equation $y = 4(x+2)^2 - 3$

Identify the following parts of the parabola.

Vertex: _____

Axis of Symmetry: _____

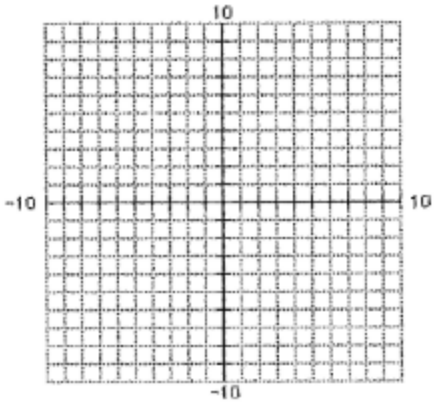
Direction: _____

x-intercepts: _____

x-intercepts: _____

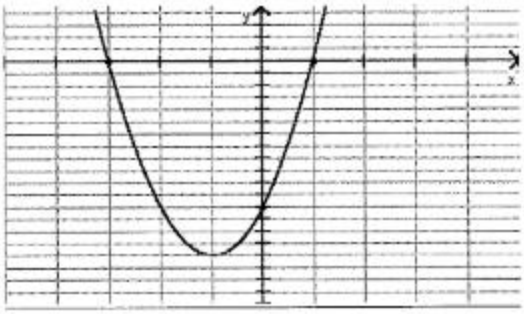
Domain: _____

Range: _____



Writing Quadratic Equations
Write the equation for the following graphs.

19. _____



20. _____

21. Write the equation for the quadratic function with a vertex at (-2 ,3) and passes through the point (4, 12)

Part II.

1. **Solve $|5x + 9| + 16 = 22$. Check your solutions.**

   a. $\{-\frac{3}{5}, 3\}$

   b. $\{\frac{3}{5}, 3\}$

   c. $\{-3, \frac{3}{5}\}$

   d. $\{-3, -\frac{3}{5}\}$

2. **Solve $5x + 24 = |8 - 3x|$. Check your solutions.**

   a. {-16}

   b. {-2}

   c. {-16, -2}

   d. {2, 16}

3. **Given the function $f(x) = -3x^2 - 7x + 23$, find $f(-4)$.**

   a. 3

   b. 195

   c. 99

   d. -5

4. **Given the function $f(x) = -3x^2 - 7x + 23$, find $f(n + 5)$.**

   a. $-3n^2 - 37n + 28$

   b. $-3n^2 - 25n - 87$

   c. $-3n^2 - 37n - 87$

   d. $-3n^2 - 37n + 17$

5. **Find the slope of the line containing the points (-5,4) and (6,-9).**

   a. $-\frac{13}{11}$

   b. -13

   c. $-\frac{11}{13}$

   d. $-\frac{3}{5}$

6. **Determine the slope of the line $7x - 4y = 12$**

a. 7

b. $\frac{4}{7}$

c. -3

d. $\frac{7}{4}$

7. **Find the standard form of a line that contains the point (5,-7) and has a slope $m = -\frac{13}{5}$.**

a. $\frac{13}{5}x + y = 6$

b. $13x + 5y = 30$

c. $5x - 7y = 6$

d. $y = -\frac{13}{5}x + 6$

8. **Find the slope-intercept form of a line passing through the points $(-4, 1)$ *and* $(5, 2)$.**

a. $y = -\frac{5}{3}x + \frac{31}{3}$

b. $y = 3x - 13$

c. $y = -\frac{1}{9}x + \frac{23}{9}$

d. $y = \frac{1}{9}x + \frac{13}{9}$

9. **Write the slope-intercept form of the equation of a line passing through the point (2,1) and perpendicular to the line $4x - 2y = 3$.**

a. $y = 2x - 3$

b. $y = -\frac{1}{2}x + 2$

c. $y = \frac{1}{2}x$

d. $y = 2x + 5$

10. Write the slope-intercept form of the equation of a line passing through the point (1, -1), parallel to the line passing through the points (4, 1) and (2, -3).

a. $y = 2x - 3$

b. $y = -5x + 4$

c. $y = -3x + 2$

d. $y = 4x + 7$

11. $\sqrt{162}$

a. $2\sqrt{3}$

b. $9\sqrt{2}$

c. $3\sqrt{3}$

d. $3\sqrt{2}$

12. $\sqrt{150a^2b^2c}$

a. $6abc\sqrt{5}$

b. $5abc\sqrt{6}$

c. $5ab\sqrt{6c}$

d. $6ab\sqrt{5c}$

13. Simplify: $-6\sqrt{5} - 2\sqrt{49} - 3\sqrt{45}$

a. $-9\sqrt{5} + 14$

b. $-9\sqrt{5} - 14$

c. $-15\sqrt{5} - 14$

d. $-15\sqrt{5} - 7$

14. Simplify $(\sqrt{16} - \sqrt{8})^2$

a. $24 - 16\sqrt{2}$

b. $2 + 16\sqrt{2}$

c. $8 - 16\sqrt{2}$

d. $8 - 16\sqrt{2}$

15. Simplify $\frac{6\sqrt{3}}{-9+\sqrt{6}}$

a. $\frac{-54\sqrt{3}-18\sqrt{2}}{75}$

b. $\frac{-54\sqrt{3}+18\sqrt{2}}{\left(-9-\sqrt{6}\right)}$

c. $\frac{\left(-9-\sqrt{6}\right)}{75}$

d. $\frac{6\sqrt{3}}{75}$

16. Solve the radical equation: $\sqrt{9x-9}+5=10$

a. $\frac{34}{9}$

b. $\frac{104}{9}$

c. $\frac{109}{9}$

d. $\frac{14}{9}$

17. Solve the system of equations: $\begin{cases} 2x-y=7 \\ 3x+y=8 \end{cases}$

a. (-1, 3)

b. (1, -3)

c. (-3, 1)

d. (3, -1)

18. Solve the system of equations: $\begin{cases} 5x+2y=-8 \\ 4x+3y=2 \end{cases}$

a. (-4, 6)

b. (4, -6)

c. (6, -4)

d. (-6, 4)

19. Solve the system of equations: $\begin{cases} 2y = 3x - 7 \\ 4x = 3y + 10 \end{cases}$

a. (-1, -2)

b. (1, 2)

c. (2, -1)

d. (1, -2)

20. Factor completely: $2x^2 - 3x - 2$

a. $(2x + 1)(x + 2)$

b. $(2x - 1)(x + 2)$

c. $(2x - 1)(x - 2)$

d. $(2x + 1)(x - 2)$

21. Factor completely: $16x^2 - 8x + 1$

a. $(4x + 1)(4x - 1)$

b. $(8x + 1)(8x - 1)$

c. $(4x - 1)^2$

d. $(4x + 1)^2$

22. Factor completely: $6x^2 + 5x - 6$

a. $(3x - 2)(2x + 3)$

b. $(3x - 2)(3x + 2)$

c. $(2x + 3)(2x - 3)$

d. $(3x + 2)(2x - 3)$

23. Factor completely: $8x^2 - 4x - 24$

a. $4(2x^2 - x - 6)$

b. $(2x + 3)(4x - 8)$

c. $4(2x + 3)(x - 2)$

d. $4(2x - 3)(x + 2)$

24. Factor completely: $a^2 - 4ab + 4b^2$

a. $(a + 2b)(a - 2b)$

b. $(a + 2b)(a + 2b)$

c. $(2a + b)(a - 2b)$

d. $(a - 2b)(a - 2b)$

25. Factor completely: $36x^2 - 100y^2$

a. $(6x + 10y)(6x - 10y)$

b. $2(18x^2 - 50y^2)$

c. $4(3x + 5y)(3x + 5y)$

d. $4(3x + 5y)(3x - 5y)$

26. Factor completely: $8x^3 - 27$

a. $(2x - 3)(2x^2 - 6x - 3)$

b. $(2x - 3)(4x^2 + 6x + 9)$

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

d. $(2x + 3)(4x^2 + 6x + 9)$

27. Factor completely: $8x^3 - 128x$

a. $8(x + 4)(x - 4)$

b. $8(x^2 - 16)$

c. $8x(x + 4)(x - 4)$

d. $8x(x^2 - 16)$

28. Solve the equation by factoring: $6x^2 - 2x = 0$

a. $\{0, \frac{1}{3}\}$

b. $\{\frac{1}{3}, 2\}$

c. $\{-\frac{1}{3}, 0\}$

d. $\{-\frac{1}{3}, 2\}$

29. Solve the equation by factoring: $x^2 + x - 30 = 0$

a. $\{-5, 6\}$

b. $\{-6, -5\}$

c. $\{-6, 5\}$

d. $\{5, 6\}$

30. Solve the equation by factoring: $6x^2 - 5x - 4 = 0$

a. $\{-\frac{1}{2}, \frac{4}{3}\}$

b. $\{-\frac{4}{3}, -\frac{1}{2}\}$

c. $\{-\frac{4}{3}, \frac{1}{2}\}$

d. $\{\frac{1}{2}, \frac{4}{3}\}$

31. Solve the equation by factoring: $12x^2 = -18x - 6$

a. $\{\frac{1}{2}, 1\}$

b. $\{-\frac{1}{2}, 1\}$

c. $\{-1, \frac{1}{2}\}$

d. $\{-1, -\frac{1}{2}\}$

32. Find the product: $(-5xy)(4x^2)(-3y^4)$

a. $-4x^3y^5$

b. $-60x^3y^5$

c. $60x^2y^4$

d. $60x^3y^5$

33. Find the product: $(2x^3y^2z^5)^3(-3xy^2z)^2$

a. $72x^{11}y^{10}z^{17}$

b. $36x^8y^9z^{10}$

c. $-72x^{11}y^{10}z^{16}$

d. $-36x^{11}y^{10}z^{17}$

34. Simplify the expression: $\frac{(3xy)^2z^{-4}}{x^{-1}y^2z^7}$

a. $\frac{9x^2}{yz^{11}}$

b. $\frac{9x^3}{z^{11}}$

c. $\frac{6x}{z^3}$

d. $\frac{6xy}{z}$

35. Simplify the expression: $\frac{(-2mn^2)^{-3}}{4m^{-6}n^4}$

a. $\frac{m^5}{32n^{10}}$

b. $\frac{2m^9}{n}$

c. $-\frac{m^3}{32n^{10}}$

d. $\frac{8n}{m}$

36. Multiply the polynomials: $(x-3)(x^2-4x+2)$

a. $x^3+7x^2+14x+6$

b. $x^3-7x^2+14x-6$

c. $x^3-x^2+14x-6$

d. $x^3+x^2+14x-6$

37. Multiply the polynomials: $(3x^2-2x+1)(2x^2-3x-4)$

a. $6x^4-13x^3-4x^2+5x-4$

b. $6x^4-5x^3-8x^2+11x-4$

c. $6x^4+5x^3-4x^2-5x-4$

d. $6x^4+13x^3-8x^2-11x$

38. Write a quadratic equation in standard form with the given roots: –5 and 2

a. $x^2 - 7x + 10 = 0$

b. $x^2 + 7x + 10 = 0$

c. $x^2 - 3x + 10 = 0$

d. $x^2 + 3x - 10 = 0$

39. Determine whether the given function has a maximum or a minimum value. Then find the maximum of minimum value of the function:

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

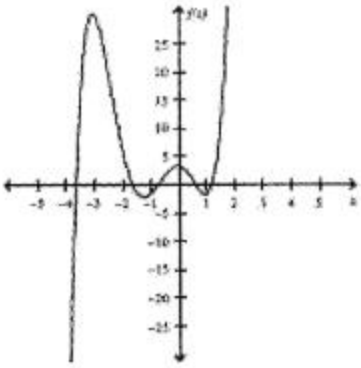
a. The function has a maximum value. The maximum value of the function is 1.

b. The function has a maximum value. The maximum value of the function is 5.

c. The function has a minimum value. The minimum value of the function is 1.

d. The function has a minimum value. The minimum value of the function is 5.

40. For the given graph,



a. describe the end behavior,
b. determine whether it represents an odd-degree or even-degree polynomial function, and
c. state the number of real zeros.

a. The end behavior of the graph is $f(x) \to +\infty$ as $x \to +\infty$ and $f(x) \to +\infty$ as $x \to -\infty$.
It is an odd-degree polynomial function.
The function has five real zeros.

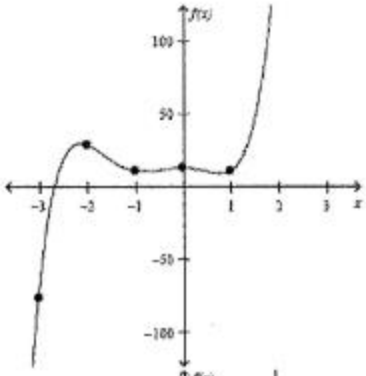
b. The end behavior of the graph is $f(x) \to +\infty$ as $x \to +\infty$ and $f(x) \to -\infty$ as $x \to -\infty$.
It is an odd-degree polynomial function.
The function has five real zeros.

c. The end behavior of the graph is $f(x) \to +\infty$ as $x \to +\infty$ and $f(x) \to -\infty$ as $x \to -\infty$.
It is an odd-degree polynomial function.
The function has four real zeros.

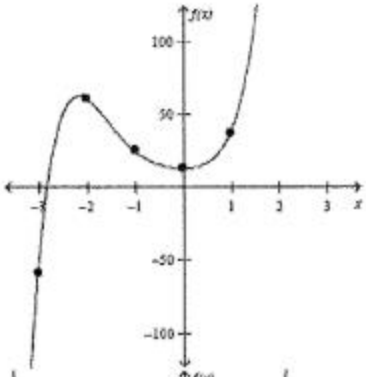
d. The end behavior of the graph is $f(x) \to +\infty$ as $x \to +\infty$ and $f(x) \to -\infty$ as $x \to -\infty$.
It is an even-degree polynomial function.
The function has five real zeros.

41. Graph the function $f(x) = 3x^5 + 8x^4 - 3x^3 - 10x^2 + 12$ by making a table of values.

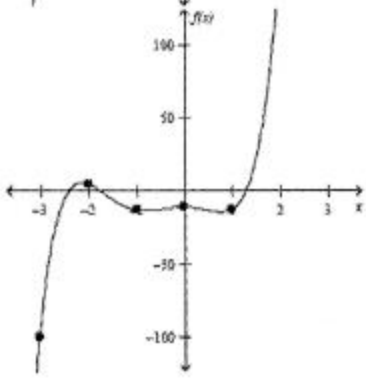
a.



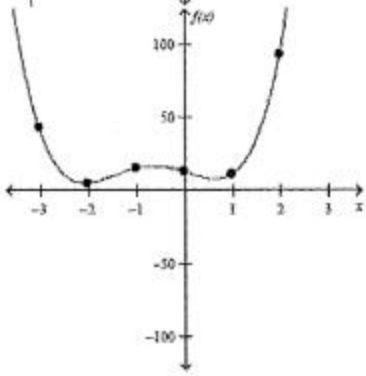
c.



b.



d.



42. Simplify the rational expression. Then state the excluded values: $\frac{x^2-4}{x^2+6x+8}$

a. $\frac{x+2}{x+4}$; $x \neq -4$ *and* $x \neq 2$

b. $\frac{x-2}{x+4}$; $x \neq -4$ *and* $x \neq -2$

c. $\frac{x-2}{x+2}$; $x \neq -2$ *and* $x \neq 2$

d. $\frac{x-2}{x+2}$; $x \neq -4$ *and* $x \neq -2$

43. Multiply the rational expression: $\frac{x^2-64}{2x+16} \cdot \frac{x+8}{x^2+16x+64}$

a. $\frac{x-8}{x+8}$

b. $\frac{x-8}{2}$

c. $\frac{x+8}{2}$

d. $\frac{x-8}{2(x+8)}$

44. Divide the rational expressions and write your answer in simplest terms:

$$\frac{12c^2d}{5a^2b^2} \div \frac{c^2d^2}{10ab}$$

a. $\frac{12}{abc}$

b. $\frac{24}{abd}$

c. $\frac{12c}{5ab}$

d. $\frac{24cd}{ab}$

45. Divide the rational expression and write your answer in simplest terms:

$$\frac{x^2-9}{2x^2+13x-7} \div \frac{x+3}{4x^2-1}$$

a. $\frac{(x-3)(2x+1)}{(x+7)}$

b. $\frac{(x-3)(2x-1)}{(x-7)}$

c. $\frac{(x+3)(x-3)(2x+1)}{(x+7)(x-3)}$

d. $\frac{x-3}{x+7}$

46. Add the rational expressions: $\frac{3x+3}{x^2+2x+1}+\frac{x-1}{x^2-1}$

a. $\frac{3x}{(x+1)(x-1)}$

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

c. $\frac{4}{x+1}$

d. $\frac{5x}{x+1}$

47. Subtract the rational expressions: $\frac{4}{4x^2-4x+1}-\frac{5x}{20x^2-5}$

a. $\frac{2x^2-9x-1}{(2x+1)(2x-1)^2}$

b. $\frac{-2x^2+9x+4}{(2x+1)(2x-1)^2}$

c. $\frac{2x^2+7x+4}{(2x+1)(2x-1)^2}$

d. $\frac{-2x^2+7x-4}{(2x+1)(2x-1)^2}$

48. Solve the rational equation: $\frac{2x+1}{3}-\frac{x-5}{4}=\frac{1}{2}$

a. $-\frac{13}{5}$

b. $\frac{13}{5}$

c. $\frac{5}{13}$

d. $-\frac{5}{13}$

49. Solve the rational equation: $\frac{3m+2}{5m}+\frac{2m-1}{2m}=4$

a. $\frac{1}{24}$

b. $-\frac{1}{24}$

c. 24

d. -24

Find the exact value of the expression without using a calculator or table.

1) $\cos^{-1}\left(\frac{\sqrt{3}}{2}\right)$

A) $\frac{7\pi}{4}$ B) $\frac{\pi}{6}$ C) $\frac{\pi}{4}$ D) $\frac{11\pi}{6}$

51. Find all real numbers that satisfy the equation $\cos x = 1$.

A) $\left\{x \mid x = \frac{\pi}{2} + 2k\pi\right\}$

B) $\{x \mid x = \pi + 2k\pi\}$

C) $\left\{x \mid x = \frac{3\pi}{2} + 2k\pi\right\}$

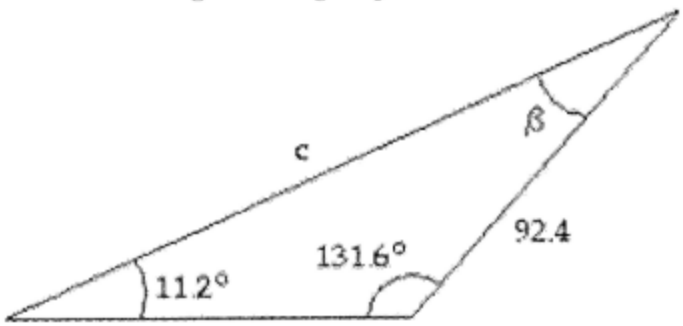
D) $\{x \mid x = 0 + 2k\pi\}$

52. Find all values of θ in [0°, 360°) that satisfy the equation.

$\sin\theta = -\frac{1}{2}$

A) {60°, 300°} B) {150°, 210°} C) {210°, 330°} D) {60°, 120°}

53. Solve the triangle with the given parts.



A) $\beta = 37.2°$, $b \approx 355.7$, $c = 287.6$

B) $\beta = 36.8°$, $b = 285$, $c \approx 355.7$

C) $\beta = 37.2°$, $b \approx 29.7$, $c = 24.1$

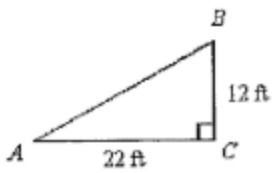
D) $\beta = 37.2°$, $b \approx 287.6$, $c \approx 355.7$

54. Find the area of the triangle using Heron' s formula. Round to the nearest unit.

$a = 64.6$
$b = 65.4$
$c = 67.2$

A) 1869 B) 1947 C) 1961 D) 1941

55. **Find the values of sine, cosine, and tangent for ∠A.**



A) $\sin A = \frac{\sqrt{157}}{11}, \cos A = \frac{\sqrt{157}}{6}, \tan A = \frac{11}{6}$

B) $\sin A = \frac{6\sqrt{157}}{157}, \cos A = \frac{11\sqrt{157}}{157}, \tan A = \frac{6}{11}$

C) $\sin A = \frac{\sqrt{157}}{6}, \cos A = \frac{\sqrt{157}}{11}, \tan A = \frac{6}{11}$

D) $\sin A = \frac{11\sqrt{157}}{157}, \cos A = \frac{6\sqrt{157}}{157}, \tan A = \frac{11}{6}$

56. In right triangle ABC, $A = 76°$, $a = 13$, and $\angle C$ is the right angle. Solve the triangle.

a. $B = 14°, b = 12.6, c = 18.1$

b. $B = 14°, b = 18.1, c = 12.6$

c. $B = 14°, b = 3.2, c = 13.4$

d. $B = 14°, b = 13.4, c = 3.2$

Exponents

Directions –Simplify using only positive exponents and no calculator!

Properties:	$a^m \cdot a^n = a^{m+n}$	$(a^m)^n = a^{mn}$	$a^{\frac{p}{r}} = \sqrt[r]{a^p}$
	$a^{-n} = \frac{1}{a^n}$	$\left(\frac{a}{b}\right)^m = \frac{a^m}{b^m}$	$\frac{a^m}{a^n} = a^{m-n}$

57. $\left(\frac{81}{64}\right)^{-\frac{1}{2}}$

58. $(27^{-2})^{-\frac{1}{3}}$

59. $\frac{(3x^2)^{-1}}{6x^{-3}}$

60. a. -2^4
b. $(-2)^4$

61. $\frac{3^{-5} \cdot 3^{10}}{3^2}$

62. $(4^{-1} + 2^{-1})^2$
- hint 1: $(a^{-m} + a^{-n})^p$ $\quad a^{-mp} + a^{-np}$
- hint 2: Apply the neg. exponent property to each term. Then get a common denom. and add

Logarithms

Directions – Solve for x.

Given $\log_b a = x$, then $b^x = a$ where $b > 0$ but b 1, and $a > 0$.

63. $3\log_2 x = 12$

64. $\log_5 125 = x$

65. $3 + 4\log_x 4 = 5$

66. $\frac{3}{2}\log_{27}(x+5) = 1$

Graph the functions:

67. $h(x) = |2x + 1|$

68. $h(x) = \begin{cases} \frac{x}{3} \; if \; x \le 0 \\ 2x - 6 \; if \; 0 < x < 2 \\ 1 \; if \; x \ge 2 \end{cases}$

Use Synthetic Division to divide:

69. $(3x^3 - 7x^2 + 9x - 14) \div (x - 2)$

70. $(x^4 - 4x^3 + x^2 + 7x - 2) \div (x + 3)$

71.

For $h(x) = x^4 - 15x^2 + 38x - 60$,

a. How many zeros should this polynomial function have?

b. How many turns could the graph of the equation make?

c. What is the end behavior of the graph of the function?

d. State the number of positive, negative, and imaginary zeros using Descartes Rule of Signs.

e. Use the Rational Zero Theorem to find the possible rational zeros of this polynomial function.

f. Find all the zeros of the polynomial function (real and imaginary).

72.

Given the following quadratic equation $y = x^2 - 8x + 15$, find

a. the direction of opening

b. the axis of symmetry

c. the vertex

d. the maximum/minimum value

e. the y-intercept

f. the x-intercepts/roots/zeros

g. graph the parabola, finding at least 3 additional points

Write the equation on vertex form.

Graph each line.

73. $y = 2x + 5$

74. $y = 0$

75. $y = -\frac{2}{3}x + 8$

76. $3x - 4y = 12$