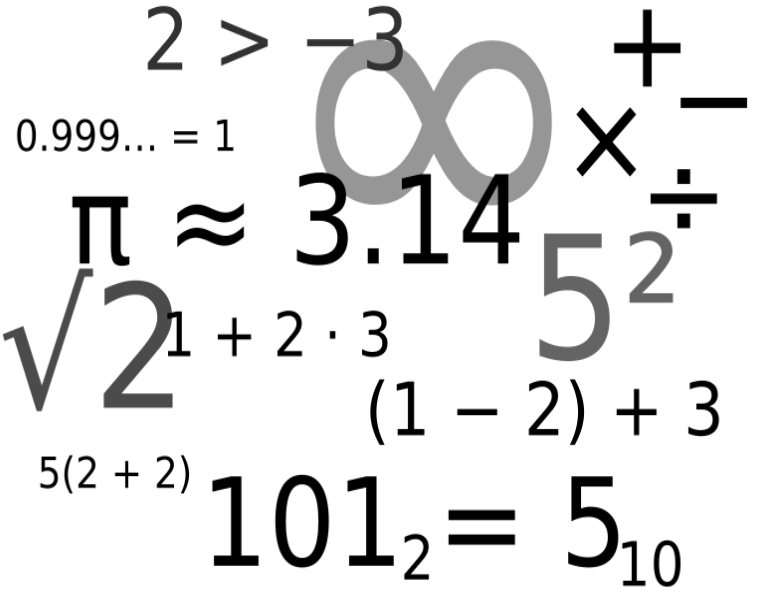
SUMMER MATH PACKET

Pre-Calculus



MATH SUMMER PACKET

INSTRUCTIONS

Attached you will find a packet of exciting math problems for your enjoyment over the summer. The purpose of the summer packet is to review the topics you have already mastered in math, and to make sure that you are prepared for the class you are about to enter.

The packet contains a brief summary and explanation of the topics so you don't need to worry if you don't have your math book. You will find many sample problems, which would be great practice for you before you try your own problems. The explanations are divided into sections to match the sample problems so you should be able to reference the examples easily.

This packet will be **due the second day of class.** All of your hard work will receive credit. The answers are provided in the back of the packet; *however,* you must show an amount of work appropriate to each problem in order to receive credit. If you are unsure of how much work to show, let the sample problems be your guide. You will have an opportunity to show off your skills during the first week when your class takes a quiz on the material in the packet.

This packet is to help you maximize your previous math courses and to make sure that everyone is starting off on an even playing field on the first day of school. If you feel that you need additional help on one or two topics, you may want to try math websites or google for help. Math teachers will be available for assistance at the high school the week before school. Check the marquee or the school website for specific times, which are to be determined.

Enjoy your summer and don't forget about the packet. August will be here before you know it! If you lose your packet, you will be able to access the packets on-line at the school website, www.oprfhs.org starting June 17th. Extra copies will also be available in the counselor's office.

See you in August!

The OPRFHS Math Department

SUMMER PACKET AP PreCalculus

Name _____

Welcome to PreCalculus! This packet contains the topics that you have learned in your previous courses that are most important to this class.

**** Denotes PreCalculus students only**

Enjoy your summer!

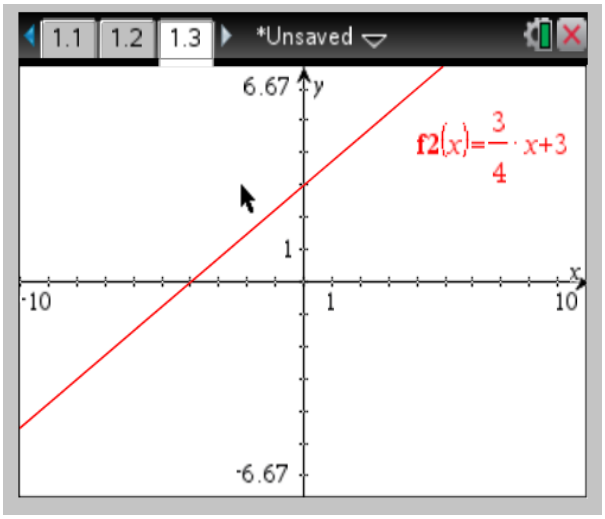
Review Topics

Note: This section is meant to be used as a REVIEW. Please read the information, do the sample problems and be prepared to turn this in when school begins.

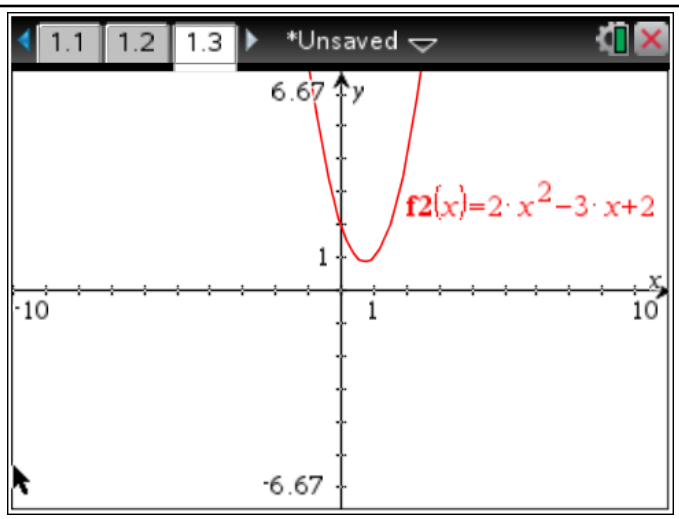
Using your graphing calculator (Keystrokes below are based on using a TI-Nspire calculator):

A. Be able to do **basic graphing**

a) Graph $y = \frac{3}{4}x + 3$

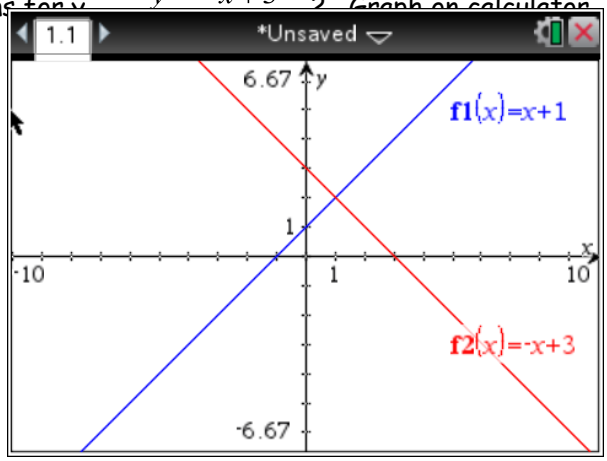


b) Graph $y = 2x^2 - 3x + 3$

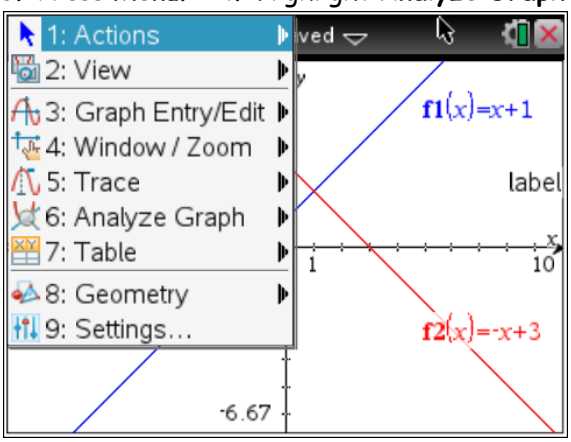


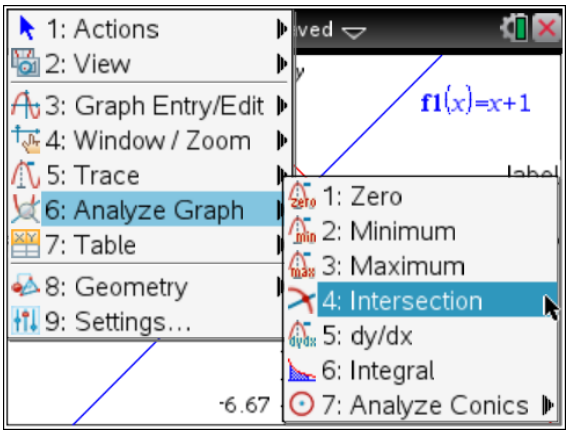
c) **Find the intersection** of the lines $y - x = 1$, $y + x = 3$ using the intersection function on your calculator. .

1. Solve the above Equations for y $y = x + 1$, $y = -x + 3$ 2. Graph on calculator

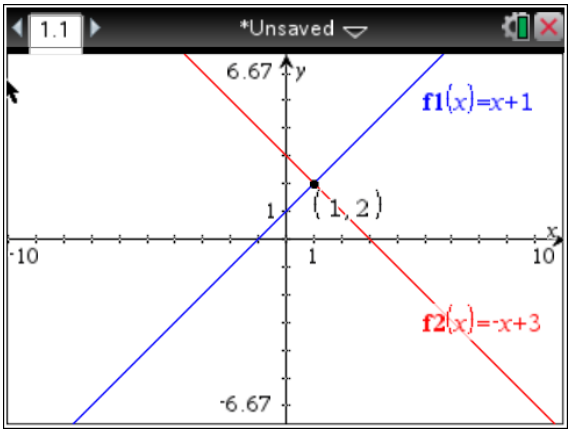


3. Press **Menu**. 4. Highlight **Analyze Graph** and **Intersection**.



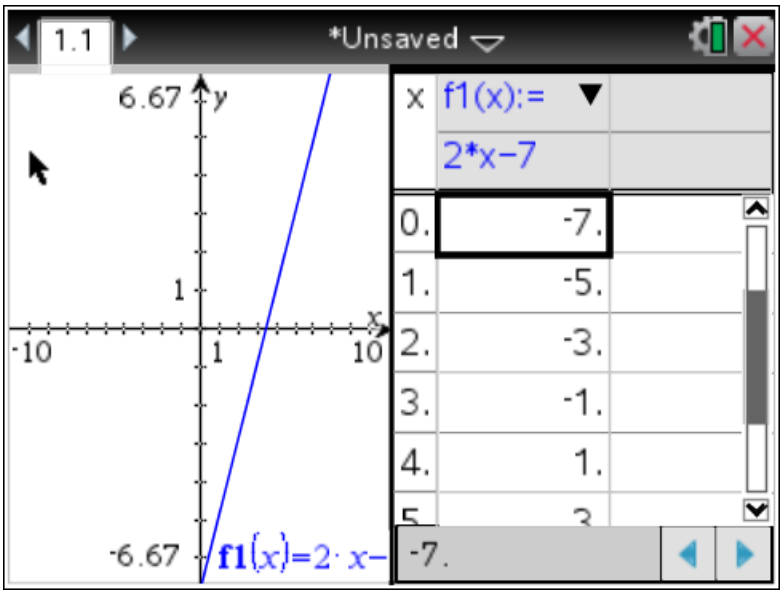


5. Using the cursor, highlight the upper and lower bounds and hit enter.

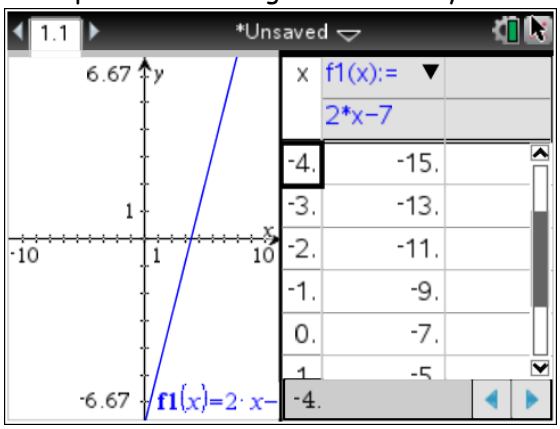


6. The *x* and *y* coordinates appear at the bottom of the screen. The solution to the system is $(1,2)$

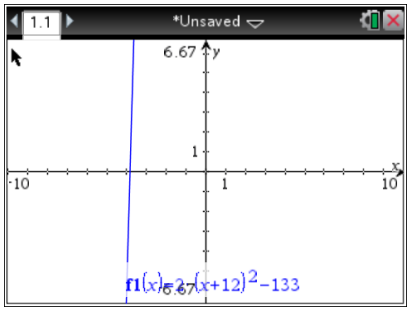
d) Find values **using tables**. 1. Graph the line $y = 2x - 7$ 2. Access the table by pressing **menu** and **Table** or use **CNTRL T**.



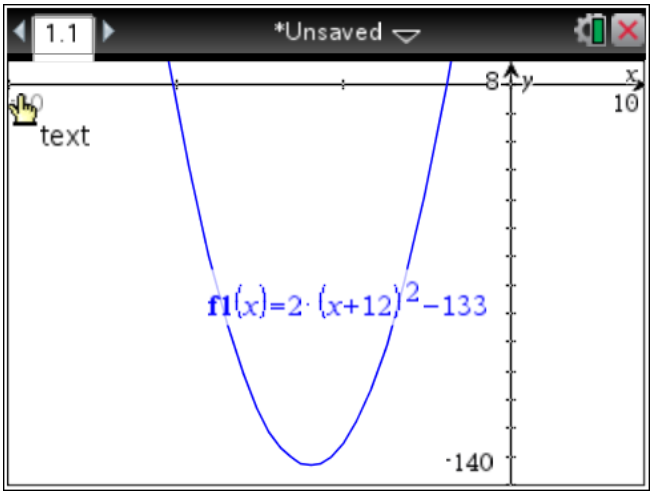
3. You can move up and down using the arrow keys while on the table.

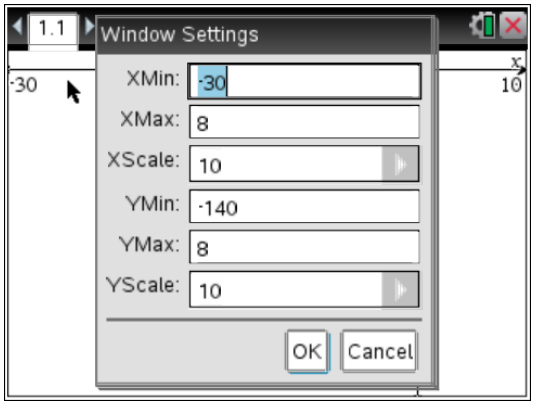


e) To see the graph of $f(x)=2(x+12)^2-133$, be able to **set the window manually**, using both your knowledge of functions and of the calculator.



To set the window so you can see the function, go to **Menu, Window/Zoom,** and **Window Settings.** Now, set your window by changing the values to look like the ones below.





Your graph should look like the one at the left.

B. Convert between decimal degrees and **degrees, minutes and seconds** using the angle function. (You will access this function by going to the **ANGLE** menu.)

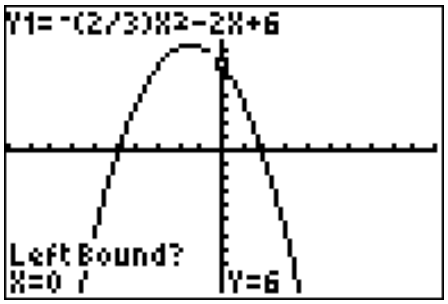
Problem: $78°07'30" \approx 78.66666667°$

$43.26° = 43°15'36"$

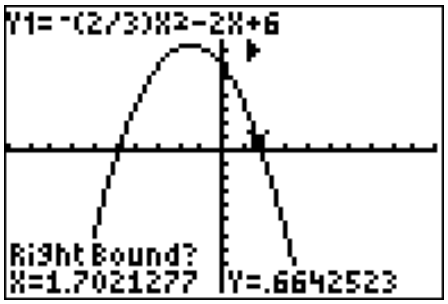
C. Be able to find the **zeros,** (also known as **roots** or **x-intercepts**) using the calculation menu.

Problem: Find the zeros of $f(x) = -\frac{2}{3}x^2 - 2x + 6$.

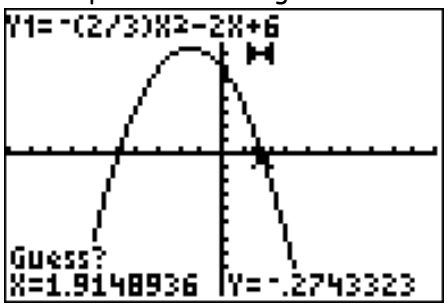
1. Enter the function into the calculator as a graph
2. Press **Menu, Analyze Graph,** and **Zero.**
3. Highlight the upper and lower bounds and hit enter.



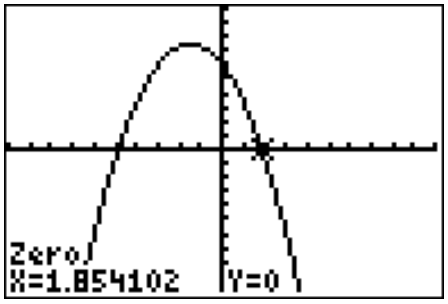
4. Use the arrow keys to move the cursor close to where the function crosses the x-axis and press ENTER. Your screen should now look like this:



5. Move cursor to the right of the zero and press ENTER again. Your screen should look like the one below.

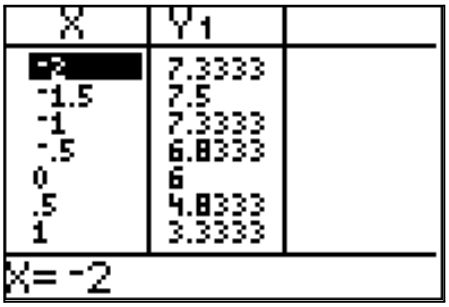


6. Press ENTER a third time and the x and y coordinates of that x-intercept will be on the bottom of the screen.



D. Know how to use the **Table Set** function.

1. Access the Table Set (**TBLSET**) function by pressing **2nd** **WINDOW**. You can change the TABLE so that the x-value increases by different increments. For example, cursor down to $\Delta Tbl =$ ____ and change the number 0.5. Then the independent variable will increase by 0.5



2. Go to the **TABLE (2nd GRAPH)** and confirm this.

II. Polynomials: Basic Operations

Expand Polynomials including multiplying two binomials, binomials by polynomials and cubing binomials.

Multiply the following:

1. $7x^3y\left(2x^2y+5xy^3\right)=14x^5y^2+35x^4y^4$

2. $(2x-3)(x+4)=2x^2+5x-12$

3.
$$\begin{aligned}(x-4)\left(2x^2+3x-6\right)&=2x^3+3x^2-6x\\&\quad -8x^2-12x+24\\&=2x^3-5x^2-18x+24\end{aligned}$$

4. $(a+b)^3=a^3+3a^2b+3ab^2+b^3$

$(a-b)^3=\left(a+(-b)\right)^3$

$(x+2)^3=x^3+6x^2+18x+8$

$(x-2)^3=x^3-6x^2+12x-8$

Be a **factoring** expert! This is very important. You should be comfortable factoring out the greatest common factor from an expression, factoring by grouping, factoring quadratics when the leading coefficient is one *and* when the leading term is something other than one. For example, you should be able to factor the following:

1. $12x^2y-20x^3y=4x^2y(3-5x)$

2. $\left(x^2-9\right)=(x+3)(x-3)$

3. $x^2+7x+12=(x+4)(x+3)$

4. $3x^2-10x-8=(3x+2)(x-4)$

5. $x^4+3x^2-10=\left(x^2+5\right)\left(x^2-2\right)$

$a^3+b^3=(a+b)\left(a^2-ab+b^2\right)$

$a^3-b^3=(a-b)\left(a^2+ab+b^2\right)$

6. Using:

Factor: $125x^3+y^3=(5x+y)\left(25x^2-5xy+y^2\right)$

Factor: $x^3-27y^3=(x-3y)\left(x^2+3xy+9y^2\right)$

III. Rational Expressions

1. Be able to **reduce** a rational expression. Problem: Simplify the rational expression below.

$$\frac{9x^2+6xy-3y^2}{12x^2-12y^2} = \frac{3\left(x^2+2xy-y^2\right)}{12\left(x^2-y^2\right)}$$

$$= \frac{3(x+y)(3x-y)}{3(4)(x+y)(x-y)}$$

Factor the numerator and denominator

$$= \frac{3(x+y)}{3(x+y)} \cdot \frac{3x-y}{4(x-y)}$$

Commutative Property

$$= \frac{3x-y}{4(x-y)}$$

Reduce fraction

2. Add, subtract, multiply and divide rational expressions.

Problem: Multiply and simplify $\frac{x+2}{x-3} \cdot \frac{x^2-4}{x^2+x-2} = \frac{(x+2)\left(x^2-4\right)}{(x-3)\left(x^2+x-2\right)}$

Multiply the numerator and denominator $= \frac{(x+2)(x+2)(x-2)}{(x-3)(x+2)(x-1)}$

Factor and reduce $= \frac{(x+2)(x-2)}{(x-3)(x-1)}$

Simplify

Problem: Divide and simplify $\frac{a^3-b^3}{a^2-b^2} \div \frac{a^2+ab+b^2}{a^2+2ab+b^2} = \frac{a^3-b^3}{a^2-b^2} \cdot \frac{a^2+2ab+b^2}{a^2+ab+b^2}$

Multiply by the reciprocal $= \frac{(a-b)\left(a^2+ab+b^2\right)(a+b)(a+b)}{(a-b)(a+b)\left(a^2+ab+b^2\right)}$

Factor and reduce $= a+b$

Problem: Addition of rational expressions $\frac{3}{x+2} + \frac{5-x}{x^2-4} = \frac{3}{x+2} + \frac{5-x}{(x+2)(x-2)}$

Factor the denominator. Find the least common denominator

$LCD = (x+2)(x-2)$ $= \frac{(x-2)}{(x-2)} \cdot \frac{3}{(x+2)} + \frac{5-x}{(x+2)(x-2)}$

Multiply by 1 in the form $\frac{(x-2)}{(x-2)}$ $= \frac{3x-6}{(x+2)(x-2)} + \frac{5-x}{(x+2)(x-2)}$

Multiply fractions $= \frac{3x-6+5-x}{x^2-4}$

Combine numerator and simplify $= \frac{2x-1}{x^2-4}$

Problem: Subtraction of rational expressions. Changing the above problem to a subtraction problem:

$$\frac{3}{x+2} - \frac{5-x}{x^2-4} = \frac{3}{x+2} - \frac{5-x}{(x+2)(x-2)}$$

Following the steps above, find LCD and multiply by 1 $= \frac{3x-6-(5-x)}{x^2-4}$

Remember to **distribute the negative!** $= \frac{4x-11}{x^2-4}$

Problem: Solving rational **equations**. $\frac{14}{x+2} - \frac{1}{x-4} = 1$

Multiply both sides by the **least common denominator**. $(x+2)(x-4)\left[\frac{14}{x+2} - \frac{1}{x-4}\right] = (1)(x+2)(x-4)$

Using the distributive law: $(x-2)(x-4)\left(\frac{14}{x+2}\right) - (x-2)(x-4)\left(\frac{1}{x-4}\right) = (x-2)(x-4)(1)$

Simplify: $14(x-4) - (x+2) = (x+2)(x-4)$ $14x-56-x-2 = x^2-2x-8$ $0 = x^2-15x+50$

$0 = (x-10)(x-5)$ $0 = x-10$ *or* $0 = x-5$ The solutions are: $x = 10,\ 5$

Problem: Solve: $\frac{7x-12}{x-3}-\frac{x^2}{x+3}=\frac{54}{x^2-9}$ Multiply both sides by the LCD:

$$(x-3)(x+3)\left[\frac{7x-12}{x-3}-\frac{x^2}{x+3}\right]=(x-3)(x+3)\left(\frac{54}{x^2-9}\right)$$

Distribute: $(x-3)(x+3)\left(\frac{7x-12}{x-3}\right)-(x-3)(x+3)\left(\frac{x^2}{x+3}\right)=(x-3)(x+3)\left(\frac{54}{x^2-9}\right)$

Simplify: $(x+3)(7x-12)-(x-3)(x^2)=54 \quad 7x^2+9x-36-(x^3-3x^2)=54$ Distribute the negative sign and continue simplifying: $7x^2+9x-36-x^3+3x^2=54 \quad -x^3+10x^2+9x-36=54$ Subtract 54 and multiply by -1: $x^3-10x^2-9x+90=0$ Factor: $x^2(x-10)-9(x-10)=0 \quad (x^2-9)(x-10)=0$

$$x^2-9=0 \quad or \quad x-10=0$$

Solve: $x=\pm 3 \quad or \quad x=10$ Since x cannot be equal to ± 3, as the denominator in the original equation will be zero, the only solution is $x=10$.

3. Simplify a complex fraction, for example:

$$\frac{\frac{2}{x}-1}{\frac{4}{x^2}-1}=\frac{\frac{2}{x}-1\left(\frac{x}{x}\right)}{\frac{4}{x^2}-1\left(\frac{x^2}{x^2}\right)}=\frac{\frac{2-x}{x}}{\frac{4-x^2}{x^2}}$$

$$=\frac{2-x}{x}\cdot\frac{x^2}{4-x^2}$$

$$=\frac{2x-x^2}{4-x^2}$$

$$=\frac{x(2-x)}{(2-x)(2+x)}$$

$$=\frac{x}{x+2}$$

4. Know the difference between *solving* and *simplifying* a rational expression.

You would *simplify*: $\dfrac{2x+1}{x+3}-\dfrac{x-1}{x-7}$

while you would *solve*: $\dfrac{2x+1}{x+3}-\dfrac{x-1}{x-7}=1$

IV. Exponents

Know the properties of exponents and be able to simplify all types of exponents, including negative and fractional exponents. For example:

$$x^{\frac{5}{6}}\cdot x^{\frac{2}{3}}=x^{\frac{5}{6}+\frac{2}{3}}$$
$$=x^{\frac{9}{6}}=x^{\frac{3}{2}}=\sqrt{x^3}$$
$$=x\sqrt{x}$$

1. Be able to find the n^{th} root of real numbers. For example:

$$9^{\frac{1}{2}}=3$$
$$27^{\frac{1}{3}}=3$$
$$(-8)^{\frac{1}{3}}=-2$$

2. Simplify using rational exponents.

$$\left(\frac{4x^{\frac{1}{3}}}{x^{\frac{1}{2}}}\right)^{\frac{1}{2}}=\frac{2}{x^{\frac{1}{12}}}$$

$$\left(4x^{\frac{1}{3}}\cdot x^{-\frac{1}{2}}\right)^{\frac{1}{2}}$$

$$4^{\frac{1}{2}}x^{\frac{1}{6}}x^{-\frac{1}{4}}=4^{\frac{1}{2}}x^{-\frac{1}{12}}=\frac{2}{x^{\frac{1}{12}}}$$

V. Radicals

1. Simplify radicals. Be able to express the following in simplest radical form:

$$\sqrt{12x^3y^5z^2} = 2xy^2z\sqrt{3xy}$$

$$\sqrt[5]{64x^7y^{10}z^3} = (2xy^2)\sqrt[5]{2x^2z^3}$$

2. Know the difference between exact versus approximate answers. For example, $\sqrt{3}$ is *exact*, while 1.732050808 is an *approximation*.

VI. Linear Equations

1. Have knowledge of linear equations. Know how to use the following formulas:

$$m = \frac{y_2 - y_1}{x_2 - x_1},\ where\ x_1 \neq x_2$$

$$y = mx + b$$

$$y - y_1 = m(x - x_1)$$

When 2 lines are parallel $(\parallel)$ their slopes are the same.

When 2 lines are perpendicular $(\perp)$ their slopes are opposite reciprocals.

$$m_1 m_2 = -1$$

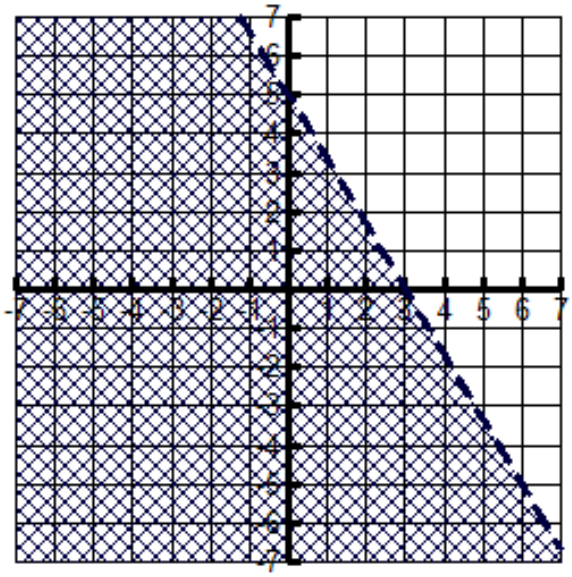
2. Solve and graph linear inequalities

$$5x + 3y < 15$$

Solve for y

$$y < -\frac{5}{3}x + 5$$

Graph and shade the correct side



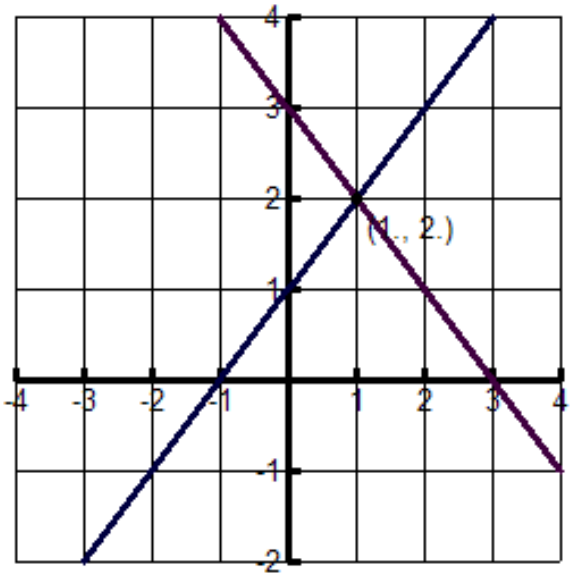
3 Solve systems of linear equations in two and three unknowns, using substitution, linear combination and matrices.

4 Be able to find the intersection of two lines on your calculator.

Problem: Solve **graphically**: $\begin{aligned} y - x &= 1 \\ y + x &= 3 \end{aligned}$

Solving both equations for y and graphing yields:

The solution to the system is $(1, 2)$



Problem: Solve using **substitution**. $\begin{aligned} 2x+y&=6 \\ 3x+4y&=4 \end{aligned}$

Solve the first equation for y. $y=6-2x$

Since y and $6-2x$ are equivalent, substitute $6-2x$ for y into the second equation.

$$3x+4(6-2x)=4$$

Use the distributive property. $3x+24-8x=4$

Solve for x. $x=4$

Substitute 4 for x in either equation and solve for y.

$$2x+y=6$$
$$2\cdot 4+y=6$$
$$y=-2$$

The solution is the ordered pair $(4,-2)$

Problem:
Solve using **linear combination**:

$$\begin{array}{rl} & 3x-4y=-1 \\ + & -3x+2y=0 \\ \hline & -2y=-1 \end{array} \qquad Add\ the\ x's\ and\ add\ the\ y's$$

Solving for y yields: $y=\frac{1}{2}$.

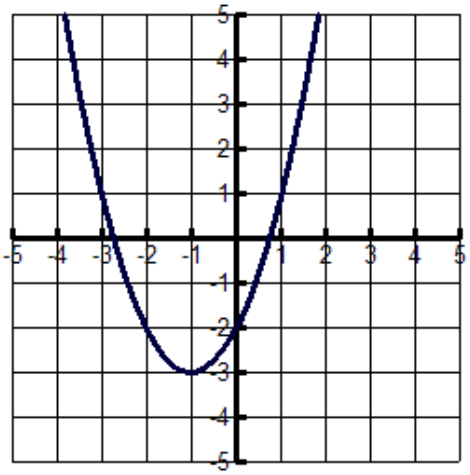
Substitute $y=\frac{1}{2}$ into either of the two original equations: $-3x+2\left(\frac{1}{2}\right)=0$

Solve for : $x=\frac{1}{3}$

The solution is the ordered pair $\left(\frac{1}{3},\frac{1}{2}\right)$

VII. Functions

1 Know how to use function notation and what it means. $f(2)=5 \longrightarrow (2,5)$
2 Identify a function from a set of ordered pairs, a graph or an equation.
3 Determine the domain and range of a function from a graph.
Given the graph:



Domain All Real Numbers

Range $y \geq -3$

4 Evaluate functions.

Given $f(x)=5x^2-3x+1$

$f(2)=15$

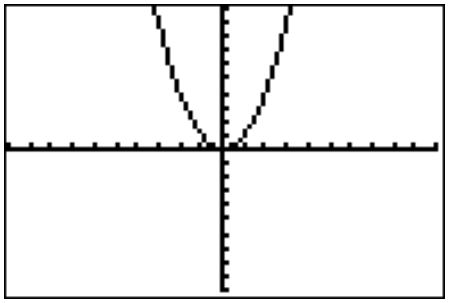
$f(0)=1$

$f(-3)=55$

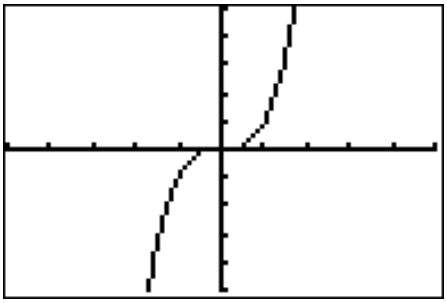
$f(h)=5h^2-3h+1$

5 Recognize the graphs of the following functions:

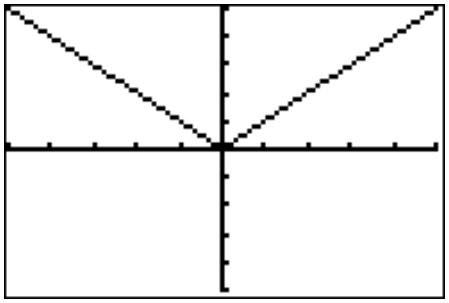
a) $f(x)=x^2$



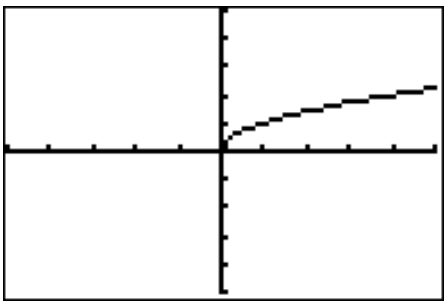
b) $f(x)=x^3$



c) $f(x)=|x|$



d) $f(x)=\sqrt{x}$



VIII. Quadratic Functions

1. Solve quadratic equations using factoring and the quadratic formula.

2. Solve equations in quadratic *form*

a) $x^4 - 3x^2 - 10 = 0$

Factor $\left(x^2 + 2\right)\left(x^2 - 5\right) = 0$ Set each factor equal to zero $x^2 + 2 = 0$ $x^2 - 5 = 0$

Solve $x = \pm i\sqrt{2}$ or $x = \pm\sqrt{5}$

b) $x - 4\sqrt{x} + 3 = 0$ Substitute: $a = \sqrt{x}$

$a^2 - 4a + 3 = 0$ Solve for a: $a = 1$ or $a = 3$ Substitute: $\sqrt{x} = a$ $\sqrt{x} = 1$ or $\sqrt{x} = 3$ Square both sides: $x = 1$ or $x = 9$ Check your answer!

Sample Problems

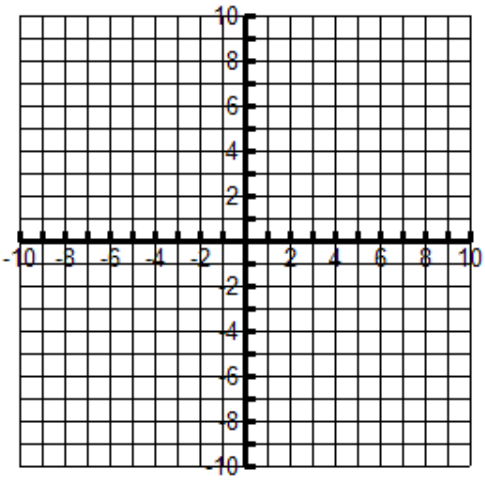
Complete the problems below, showing work where necessary. Feel free to do your work on separate sheets of paper, which you should attach. Remember you will be required to turn this in. An answer key is provided for you, but in math class, the work is as important as the answer!

**** Denotes PreCalculus students only**

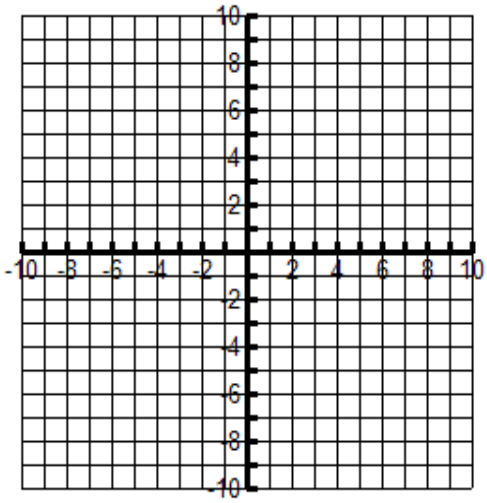
I. Perform the following operations using your graphing calculator.

1. Graph the following on your calculator and sketch the graph on the axis provided.

a) $y = -\frac{7}{6}x - 2$



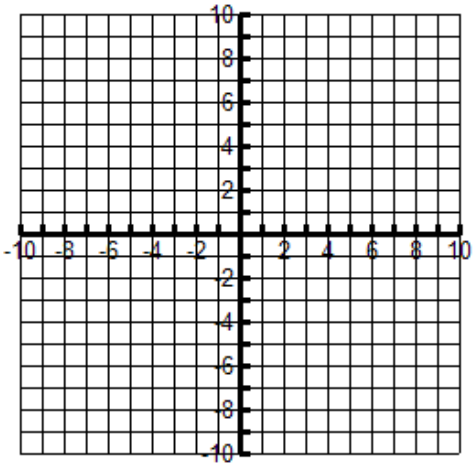
b) $y = 3x^2 - 7x + 3$

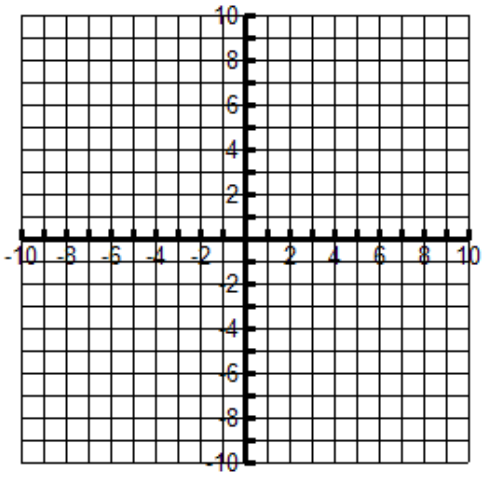


2. Find the intersection of the following systems of equations using your graphing calculator.

a) $y - x = 1$
$y + x = 3$

b) $x - 5y = 4$
$y - 2x = 1$





3. Find the roots of the following using your graphing calculator: $f(x) = -5x^2 + 5x + 3$.

4. Complete the following table for $f(x) = -3x^2 - 5x + 1$, using the ask function on your calculator.

X	Y_2
6	
-2	
1	

II. Polynomials

Multiply the following:

5. $(2x^2 + 4x + 16)(3x - 4)$

6. $(4a^2b - 2ab + 3b^2)(ab - 2b)$

7. $(5x + 2y)^2$

8. $(5x^3 + 2y^2)^2$

9. $\left(m^2-2n\right)^3$

10. $\left(3t^2+4\right)^3$

11. $\left(x+h\right)^2-4\left(x+h\right)-9-\left(2x^2-4x-9\right)$

Factor the following completely:

12. $w^2-7w+10$

13. $2x^2+6x-56$

14. $a\left(b-2\right)+c\left(b-2\right)$

15. $x^3+3x^2+6x+18$

16. y^2-64z^2

17. $6y^4-96x^4$

18. $x^3 - 27$

19. $4t^3 - 32$

20. $6(2p+q)^2 - 5(2p+q) - 25$

III. Rational Expressions

Simplify the following:

21. $\dfrac{(x^2-4)(x+1)}{(x+2)(x^2-1)}$

22. $\dfrac{a^2-a-6}{a^2-7a+12} \cdot \dfrac{a^2-2a-8}{a^2-3a-10}$

23. $\dfrac{3x+12}{2x-8} \div \dfrac{(x+4)^2}{(x-4)^2}$

24. $\dfrac{a^2-a-2}{a^2-a-6} \div \dfrac{a^2-2a}{2a+a^2}$

25. $\dfrac{a-3b}{a+b} + \dfrac{a+5b}{a+b}$

26. $\dfrac{6}{y^2+6y+9} - \dfrac{5}{y+3}$

27. $\dfrac{5a}{a-b} + \dfrac{ab}{a^2-b^2} + \dfrac{4b}{a+b}$

28. $\dfrac{\dfrac{x^2-y^2}{xy}}{\dfrac{x-y}{y}}$

29. $\dfrac{a-\dfrac{a}{b}}{b-\dfrac{b}{a}}$

30. $\dfrac{\dfrac{a^2}{b}+\dfrac{b^2}{a}}{a^2-ab+b^2}$

31. $\dfrac{c+2}{5c-5}-\dfrac{c-2}{3c-3}+\dfrac{c}{1-c}$

32. $\dfrac{1+\dfrac{2}{x}-\dfrac{15}{x^2}}{1+\dfrac{4}{x}-\dfrac{5}{x^2}}$

**33. $\dfrac{x^2y^{-2}-y^2x^{-2}}{xy^{-1}+yx^{-1}}$

**34. $\dfrac{x^{-1}+y^{-1}}{x^{-2}-y^{-2}}$

IV. Exponents

Use the properties of exponents to simplify the following:

35. $\left(4xy^2\right)\left(3x^{-4}y^5\right)$

36. $\left(2x\right)^3\left(3x\right)^3$

---

37. $\dfrac{12x^2y^3z^{-2}}{21xy^2z^3}$

38. $\dfrac{\left(3ab^{-2}c^4\right)^3}{\left(2a^{-1}b^2c^{-3}\right)^2}$

**39. $2m^{\frac{1}{3}}\left(3m^{\frac{2}{3}} - m^6\right)$

**40. $\left(3x^{\frac{1}{2}} - y^{\frac{1}{2}}\right)^2$

41. *Find* $-x^2$ *and* $(-x)^2$, *when*

a) $x = 5$

b) $x = -7$

V. Radicals

Write the following in simplest radical form:

42. $\sqrt{180}$

43. $\sqrt{162c^4d^5}$

44. $\sqrt{2x^3y}\sqrt{12xy}$

45. $\sqrt[3]{3x^2y}\sqrt[3]{36xy}$

46. $\dfrac{\sqrt{21ab^2}}{\sqrt{3ab}}$

47. $\sqrt{\dfrac{9a^2}{8b}}$

48. $\sqrt[3]{\dfrac{2x^2 2y^3}{25z^4}}$

49. $\sqrt{12}-\sqrt{27}+\sqrt{75}$

50. $2\sqrt[3]{8x^2}+5\sqrt[3]{27x^2}-3\sqrt[3]{x^3}$

51. $\left(\sqrt{y}-2\right)\left(\sqrt{y}-4\right)$

**52. $\left(\sqrt[3]{x^2}-\sqrt[3]{y^2}\right)\left(\sqrt[3]{x}+\sqrt[3]{y}\right)$

**53. $\dfrac{1}{\sqrt[3]{m}+2}$

54. $\dfrac{2\sqrt{5}+3\sqrt{2}}{5\sqrt{5}+2\sqrt{2}}$

**55. $\sqrt{\sqrt[6]{x^8y^6}}$

VI. Linear Functions

56. Write the equation of the line containing the points $(2,-4)\ and\ (4,-3)$ in slope intercept form.

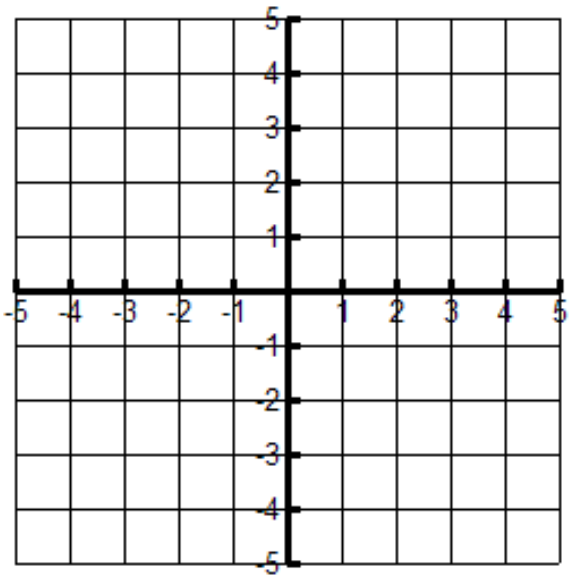
57. Determine whether the following lines are parallel, perpendicular or neither.

$2x-5y=-3$ $\quad$ $4y=8-x$ $\quad$ $x+2y=5$

a) $2x+5y=4$ $\quad$ b) $y=4x-5$ $\quad$ c) $2x+4y=8$

58. Find the equations of the lines parallel *and* perpendicular to the given line $2x+y=-4$, and containing the given point $(-4,-5)$

59. Solve the following inequality. $y > -\frac{2}{3}x + 2$



60. Solve the following system of equations graphically, *using your calculator.*

$5x + y = -2$

$x + 7y = 3$

61. Solve using substitution.

$x - 5y = 4$

$y = 7 - 2x$

62. Solve using the elimination method.

$2x + 3y = 5$

$4x + 7y = 11$

63. Solve using elimination.

$2x - 4y + 6z = 22$

$4x + 2y - 3z = 4$

$3x + 3y - z = 4$

64. Solve using matrices.

$$x + y + z = 6$$
$$2x - y - z = -3$$
$$x - 2y + 3z = 6$$

VII. Functions

Using your knowledge of functions answer the following:

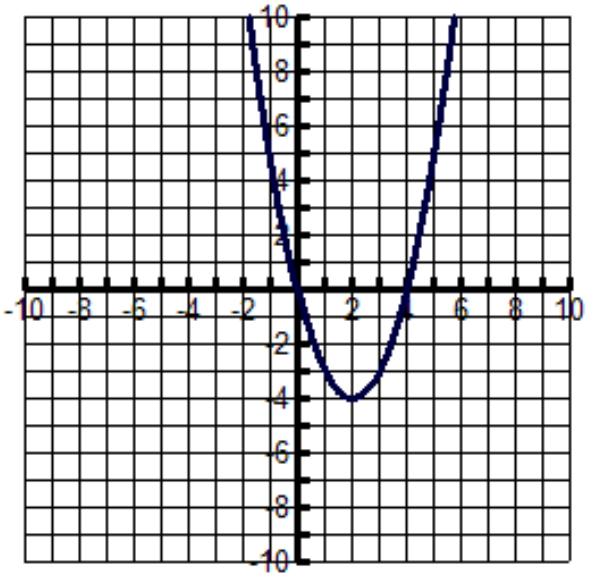
65. Determine whether the following are functions:

a) $\{(2,-3),(7,9),(-11,13),(2,6)\}$

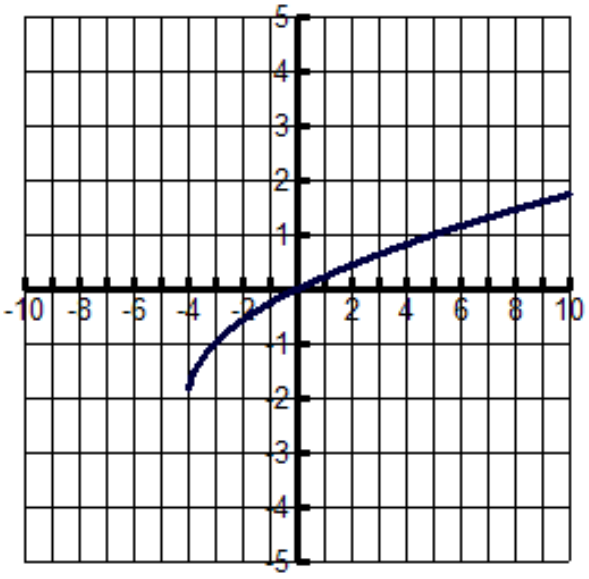
b) $\{(1,19),(-2,11),(6,-9),(7,11)\}$

66. Determine the domain and range of the following graphs:

a)



b)



67. Evaluate the following:

$f(x) = 5x^2 - 4x$ for

a) $f(3)$

b) $f(-2)$

c) $f(t-1)$

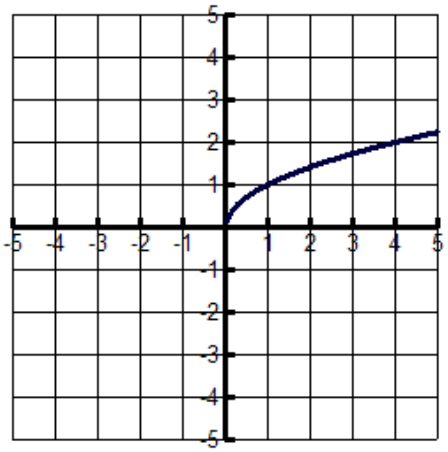
d) $f(a+h) - f(a)$

68. Following are the graphs of the functions

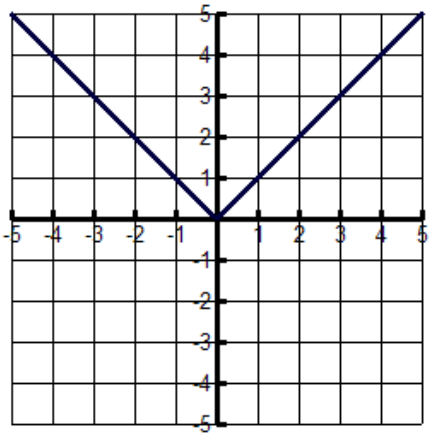
$f(x)=x^2,\quad f(x)=x^3,\quad f(x)=\sqrt{x},\quad and\quad f(x)=|x|$

Label each graph with the correct function.

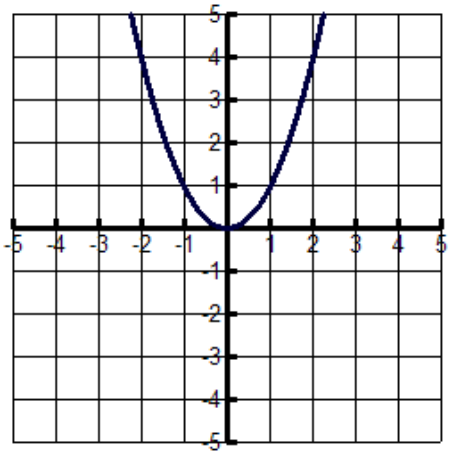
a)_____



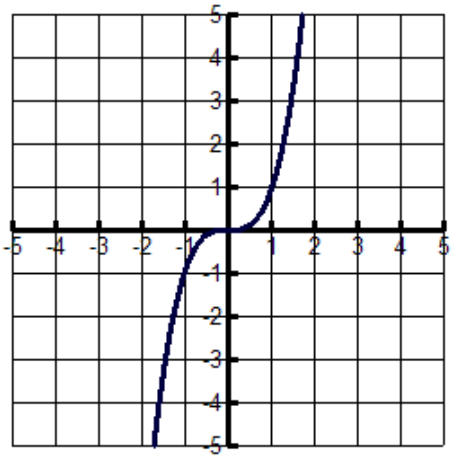
b)_____



c)_____

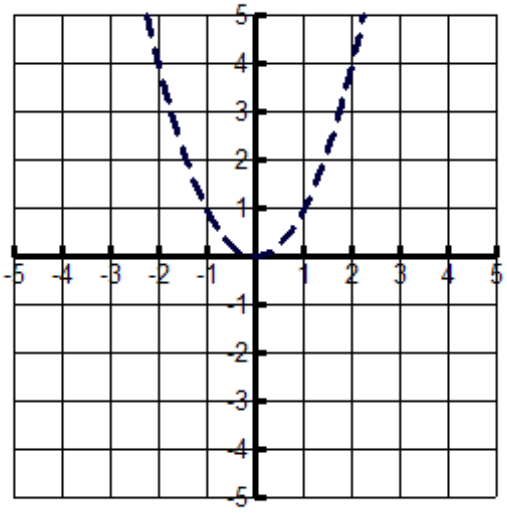


d)_____

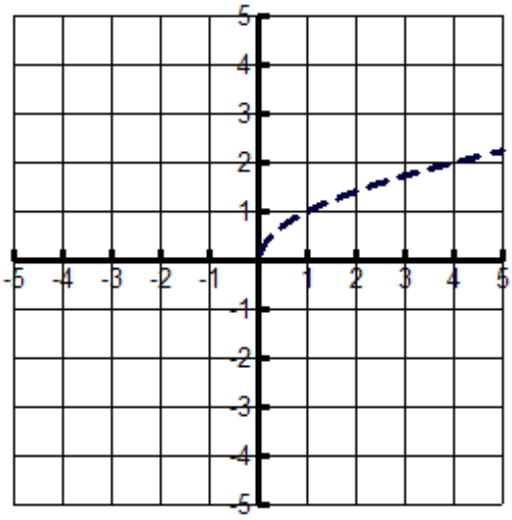


69. Perform the following transformations and translations given the parent function.

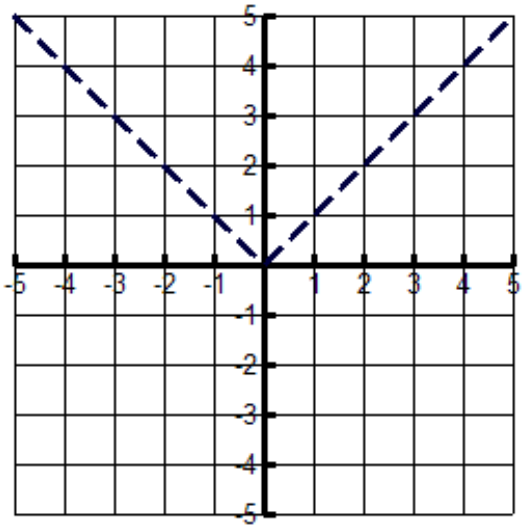
a) $f(x)=(x-2)^2+3$



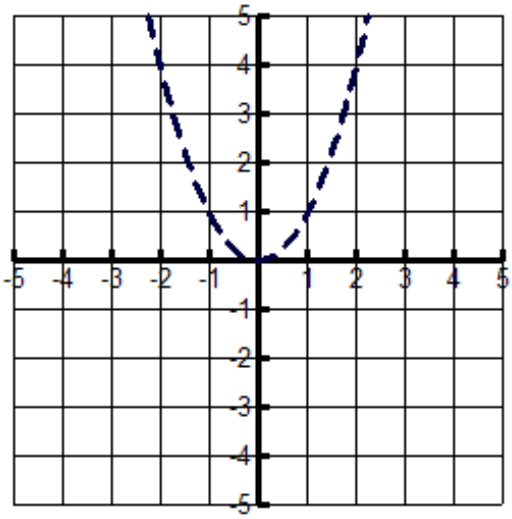
b) $f(x)=\sqrt{x+1}-3$



c) $f(x)=-|x-1|+4$



d) $f(x)=x^2+1$

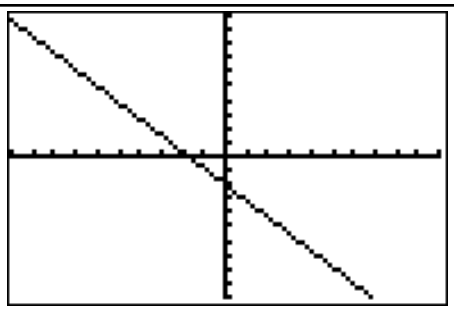
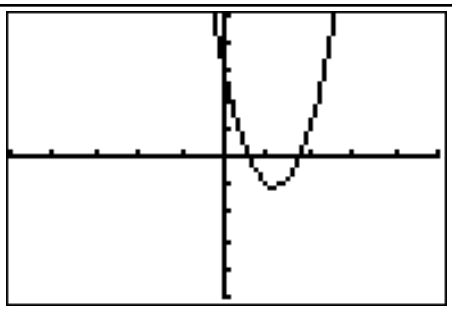


VIII. Quadratic Equations

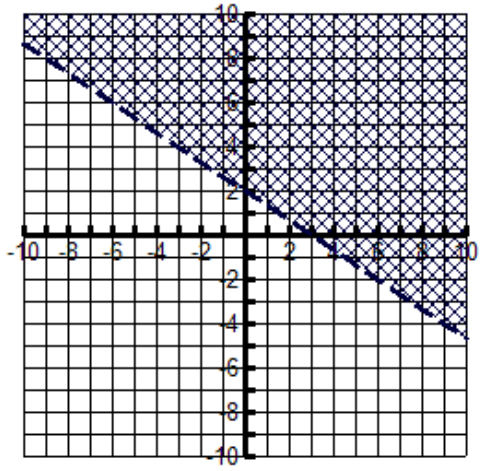
Solve the following quadratic equations:

70. $x^2 - 3x - 4 = 0$	71. $2x^2 + 3x = 2$
72. $x + 2\sqrt{x} - 3 = 0$	73. $2x^4 - 5x^2 - 3 = 0$

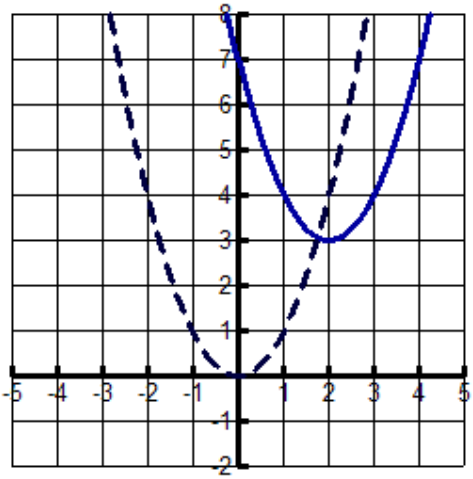
74. $(x-2)^2-2(x-2)-15=0$

	Answers:	
	1a. 	1b. 
	2a. $(1,2)$	2b. $(-1,-1)$
	3. $x=-0.42, 1.42$	$(6,-137)$ $(1,-7)$ 4. $(-2,-1)$
	5. $6x^3+4x^2+32x-64$	6. $4a^3b^2-10a^2b^2+3ab^3+4ab^2-6b^3$
	7. $25x^2+20xy+4y^2$	8. $25x^6+20x^3y^2+4y^4$
	9. $m^6-6m^4n+12m^2n^2-8n^3$	10. $27t^6+108t^4+144t^2+64$
	11. $-x^2+2xh-4h+h^2$	12. $(w-5)(w-2)$
	13. $2(x-4)(x+7)$	14. $(b-2)(a+c)$

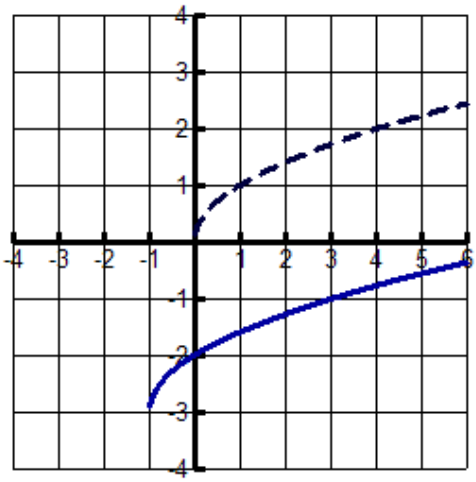
	15. $\left(x^2+6\right)\left(x+3\right)$	16. $\left(y-8z\right)\left(y+8z\right)$
	17. $6\left(y^2+4x^2\right)\left(y+2x\right)\left(y-2x\right)$	18. $\left(x-3\right)\left(x^2+3x+9\right)$
	19. $4\left(t-2\right)\left(t^2+2t+4\right)$	20. $\left(6p+3q+5\right)\left(4p+2q-5\right)$
	21. $\dfrac{x-2}{x-1}$	22. $\dfrac{a+2}{a-5}$
	23. $\dfrac{3\left(x-4\right)}{2\left(x+4\right)}$	24. $\dfrac{a+1}{a-3}$
	25. 2	26. $\dfrac{-9-5y}{\left(y+3\right)^2}$
	27. $\dfrac{5a^2+10ab-4b^2}{\left(a+b\right)(a-b)}$	28. $\dfrac{x+y}{x}$
	29. $\dfrac{a^2b-a^2}{ab^2-b^2}$	30. $\dfrac{a+b}{ab}$
	31. $\dfrac{-17c+16}{15\left(c-1\right)}$	32. $\dfrac{x-3}{x-1}$
	33. $\dfrac{x^2-y^2}{xy}$	34. $\dfrac{xy}{\left(y-x\right)}$
	35. $\dfrac{12y^7}{x^3}$	36. $216x^6$
	37. $\dfrac{4xy}{7z^5}$	38. $\dfrac{27a^5c^{18}}{4b^{10}}$
	39. $6m-2m^{\frac{19}{3}}$	40. $9x-6x^{\frac{1}{2}}y^{\frac{1}{2}}+y$
	41a. $-5^2=-25$ $\left(-5\right)^2=25$	41b. $-7^2=-49$ $\left(-7\right)^2=49$
	42. $6\sqrt{5}$	43. $9c^2d^2\sqrt{2d}$
	44. $2x^2y\sqrt{6}$	45. $3x\sqrt[3]{4y^2}$
	46. $\sqrt{7b}$	47. $\dfrac{3a\sqrt{2b}}{4b}$
	48. $\dfrac{y\sqrt[3]{20x^2z^2}}{5z^2}$	49. $4\sqrt{3}$
	50. $19\sqrt[3]{x^2}-3x$	51. $y-6\sqrt{y}+8$

	52. $x+\sqrt[3]{x^2y}-\sqrt[3]{xy^2}-y$	53. $\dfrac{\sqrt[3]{m^2}-2\sqrt[3]{m}+4}{m+8}$
	54. $\dfrac{38+11\sqrt{10}}{117}$	55. $\sqrt[6]{x^4y^3}$
	56. $y=\dfrac{1}{2}x-5$	57. $a)$ *neither* $b)\perp$ $c)$
	58. *parallel* $y=-2x-13$ *perpendicular* $y=\dfrac{1}{2}x-3$	59. 
	60. $(-0.5,0.5)$	61. $\left(\dfrac{39}{11},-\dfrac{1}{11}\right)$
	62. $(1,1)$	63. $x=3$ $y=-1$ $z=2$
	64. $x=1$ $y=2$ $z=3$	65. $a)$ *no* $b)$ *yes*
	66a. $D=$ $R=y\geq -4$	66b. $D=x>-4$ $R=y>-2$
	67. $a)\ 33$ $b)\ 28$ $c)\ 5t^2-14t+9$ $d)\ 5h^2+10ah-4h$	68. $a)\ f(x)=\sqrt{x}$ $b)\ f(x)=\lvert x\rvert$ $c)\ f(x)=x^2$ $d)\ f(x)=x^3$

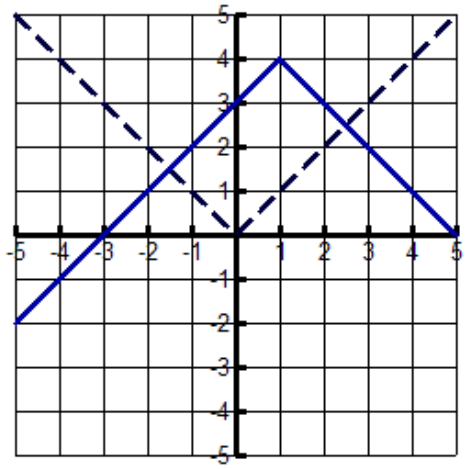
69a.



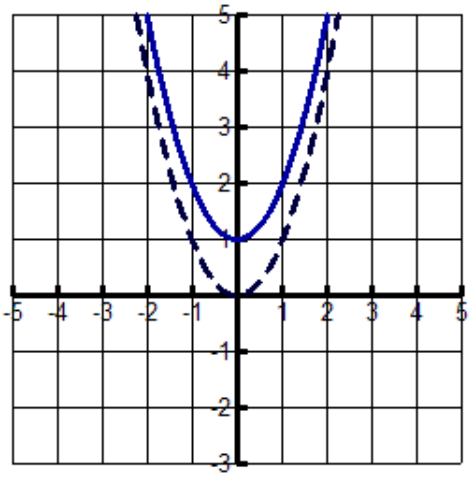
69b.



69c.



69d.



70. $x = 4, -1$

71. $x = \frac{1}{2}, -2$

72. $x = 1$

73. $x = \pm\sqrt{3}, \pm i\frac{\sqrt{2}}{2}$

74. $x = 7, -1$