Algebra 2 - 1st Semester Notes

Chapter 1: Tools of Algebra

1.2 Algebraic Expressions

1) $3a-5c-4;\ a=5\ and\ c=-2$

2) $-5(x-2y)-8;\ x=3\ and\ y=-4$

Combine Like Terms

3) $3x-5+2-x+y$

4) $4x^2-2x(7-6x)+9$

1.3 Solving Equations

1) $4a-6=18+a$

2) $3(4n-10)=12$

3) $3(x-4)=4x-7-6x$

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

5) $7.2+1.5x=-8.6+2.3x$

1.4 Solving Inequalities

$>$ $\geq$

$<$ $\leq$

Golden Rule:

1) $3x-5\geq 7$

2) $2x-8\geq 7x+1$

1.5 Absolute Value Equations and Inequalities

$|x|=5$

Absolute Value:

1) $|x+5|=2$

2) $|2x-4|-3=11$

3) $3|7-x|=-18$

4) $|2x-9|\geq 1$

5) $2|2-3x|+6<24$

1.6 Probability

$P(event)=\dfrac{want}{have}$

5 red, 6 yellow, 9 green

1) P(red)

2) P(not green)

3) P(green or yellow)

Rolling a die.

4) P(even)

5) P(7)

6) P(less than 3)

Chapter 2: Functions, Equations, and Graphs

2.1 Relations and Functions

$f(x)=3-5x,\ \ g(x)=2-x^2,\ \ h(x)=\dfrac{2}{3}x+1$

1) $f(4)$

2) $h(5)$

3) $g(-5)$

4) $f\left(\dfrac{2}{3}\right)$

2.2 Linear Equations

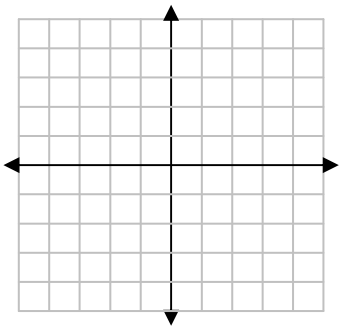
Slope-Intercept Form: $y=mx+b$

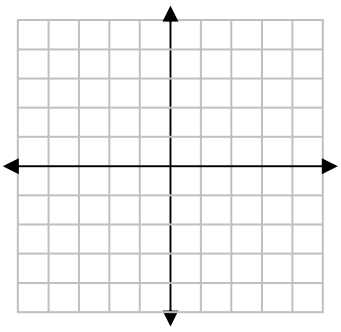
1) $y=1-3x$

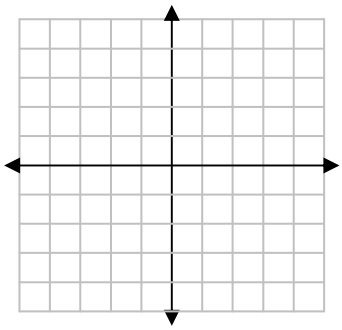
2) $3x-2y=4$

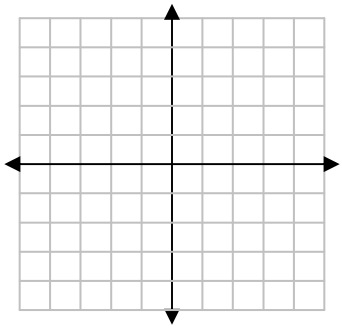
3) $y=-3$ & $x=1$

4) $y=x$





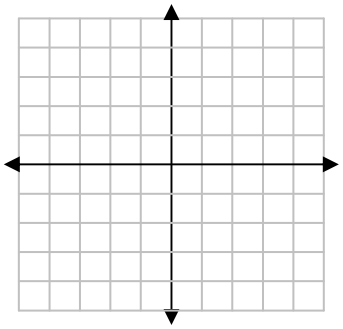




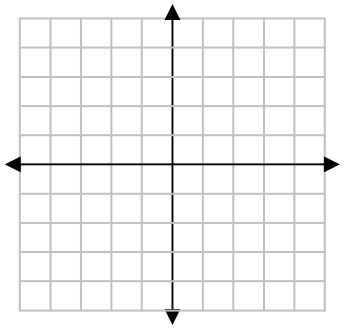
Slope: $m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{rise}{run}$

Find Slope:

5) (2,-3) and (4,1)



6) (3,2) and (3,-2)

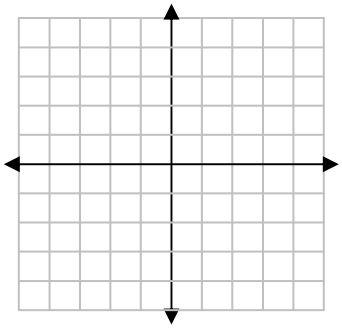


2.7 Two-Variable Inequalities

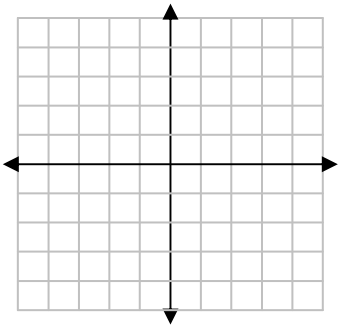
$\leq$ *or* $\geq$ $<$ *or* $>$

Graph the following

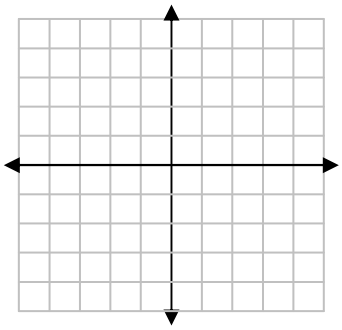
1) $y < 3 - x$



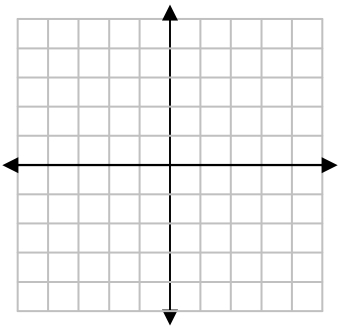
2) $-x - 4y \geq -4$



3) $x > -2$



4) $y \leq 4$

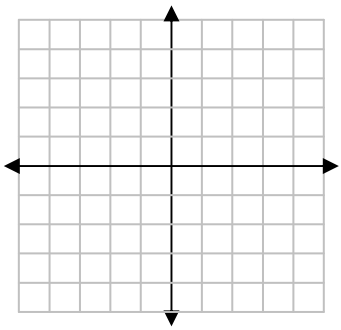


Chapter 3: Linear Systems

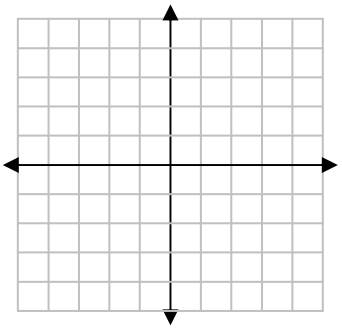
3.1 Graphing Systems of Equations

Solution to a System of Equations:

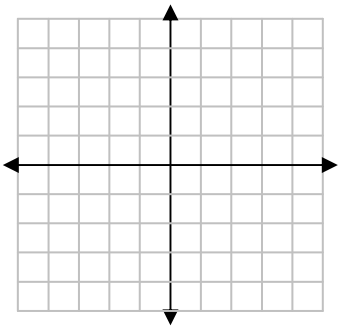
1) $\begin{cases} y = -x + 3 \\ y = \frac{3}{2}x - 2 \end{cases}$



2) $\begin{cases} 2y = 5x + 6 \\ -10x + 4y = 8 \end{cases}$



3) $\begin{cases} 2y - 3x - 6 = 0 \\ -6x + 4y - 12 = 0 \end{cases}$



3.2 Solving Systems Algebraically

Substitution Method:

1) $\begin{cases} y = x - 2 \\ 2x - y = 5 \end{cases}$

2) $\begin{cases} 2m - n = 1 \\ 10m - 5n = 8 \end{cases}$

Elimination Method:

3) $\begin{cases} -2y - 3x = -6 \\ 2y + 5x = 14 \end{cases}$

4) $\begin{cases} 2x + 4y = 10 \\ 5y + 3x = 11 \end{cases}$

5) $\begin{cases} 2x - 3y - 2 = 0 \\ 6y - 4x = -4 \end{cases}$

System Word Problems:

6) Joe is making $10 an hour and he owes $80. Kim is spending $5 an hour and has $145 saved. When will they have the same amount of money and how much will they have?

7) You sell 100 items and made $250. CDs $2 and DVDs $4. How many CDs and DVDs did you sell?

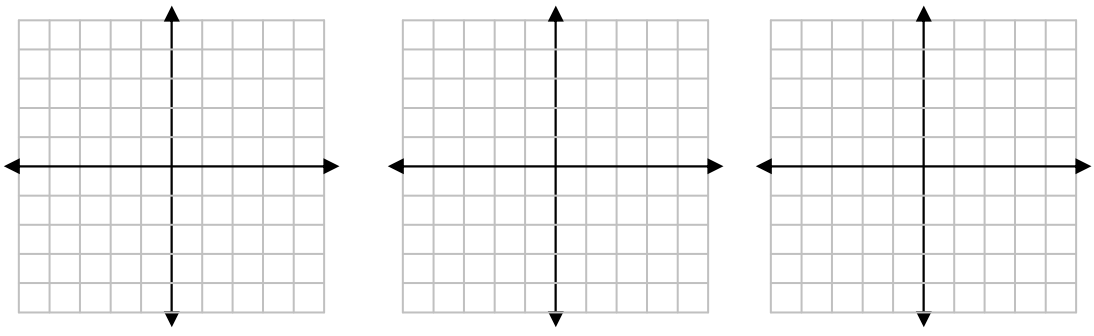
3.3 Systems of Inequalities

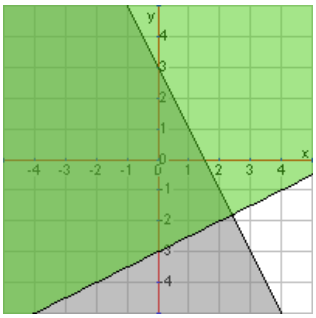
1) $\begin{cases} y < 1 - x \\ y \geq -2 \end{cases}$

2) $\begin{cases} x > -3 \\ -2x - y \leq 4 \end{cases}$

3) $\begin{cases} x < 1 \\ y \leq -x \\ y < 2 \end{cases}$

4) Which points are solutions?
a) (-2,4) b) (3,1) c) (4,-3)





3.6 Systems with Three Variables

1) $\begin{cases} 5x - y + z = 4 \\ x + 2y - z = 5 \\ 2x + 3y - 3z = 5 \end{cases}$

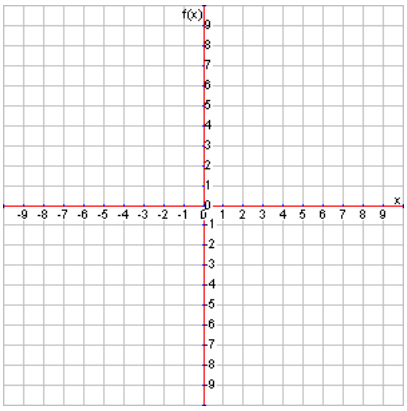
2) $\begin{cases} 4x - 2y + 5z = 6 \\ 3x + 3y + 8z = 4 \\ x - 5y - 3z = 5 \end{cases}$

Chapter 5: Quadratic Equations and Functions

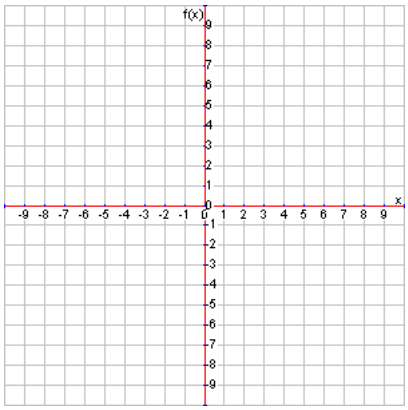
5.2 Properties of Parabolas

Standard Form: $y = ax^2 + bx + c$ Axis of Symmetry: $x = \dfrac{-b}{2a}$

1) Graph: $y = x^2 - 4x + 3$



2) Graph: $y = -2x^2 - 8x$



5.3 Transforming Parabolas

Vertex Form: $y = a(x - h)^2 + k$

Vertex: (h, k)

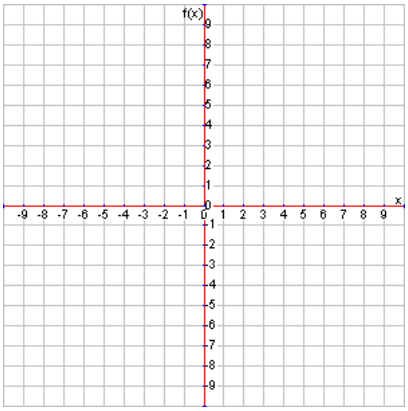
If a is negative:

If a is positive:

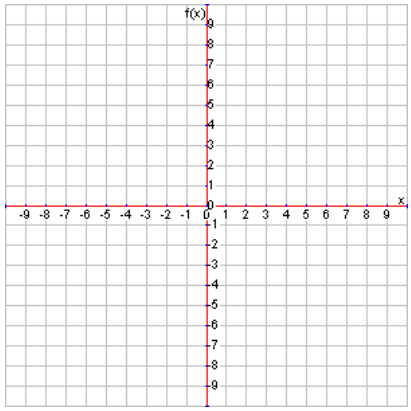
If |a| < 1:

If |a| > 1:

1) Graph: $y = -(x + 1)^2 + 3$



2) Graph: $y = 3(x - 4)^2 - 6$



5.4 Factoring Quadratic Expressions

1) $x^2 - 10x + 24$ 2) $2x^2 - 11x + 15$ 3) $9x^2 - 30x + 25$ 4) $x^2 - 81$

5) $16x^2 - 49$ 6) $2x^3 - 50x$ 7) $3x^2 - 24x - 27$

5.5 Quadratic Equations

1) $\sqrt{500}$ 2) $\sqrt{32}$ 3) $x^2 - 9x - 36 = 0$ 4) $x^2 - 11x = 7x - 32$

5) $2x^2 - 10x = 4x$ 6) $4(2x-3)(5x+7) = 0$ 7) $9x^2 = 25$ 8) $x^2 - 8 = 12$

5.6 Complex Numbers

$i =$ $i^2 =$ $i^3 =$ $i^4 =$ $i^5 =$

1) $\sqrt{-25}$ 2) $\sqrt{-50}$ 3) $(3-2i)-(-7+4i)$

4) $(3-i)(-5+4i)$ 5) $(-5i)^2$ 6) $\dfrac{3}{7i}$

7) $\dfrac{3-2i}{2+5i}$ 8) $x^2 + 6 = 2$

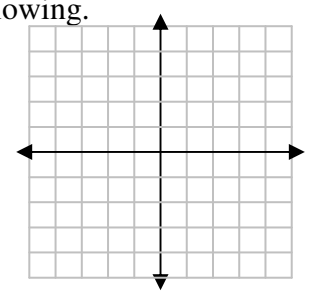
9) Plot the following.

A) $3-4i$

B) $-4+i$

C) -2

D) $3i$



5.7 Completing the Square

1) $(x+7)^2 = 25$ 2) $x^2 - 8x = -20$ 3) $x^2 + 10x - 2 = 12$

5.8 Quadratic Formula

$x = \dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ Standard Form: $ax^2 + bx + c = 0$

1) $x^2 - 2x - 3 = 0$ 2) $2x^2 - 3x = x - 5$

Chapters 6: Polynomials

6.1 Polynomial Functions

1) $(3x^2 - x + 7) - (-7x^2 + 8)$ 2) $(3x^3 - x^2 + 7) - (2x^2 - x - 10) + (x - 2)$

3) $3x^2(-x^3 + 7x)$ 5) $(2x-3)(x^2 + x - 4)$ 6) $(x-4)^3$

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

6.3 Dividing Polynomials

1) $(x^2 - 8x + 7) \div (x + 2)$ 2) $(2x^3 - 5x + 1) \div (x - 4)$

6.4 Factoring Polynomials

Difference of Cubes: $(a^3 - b^3) = (a-b)(a^2 + ab + b^2)$ *Sum of Cubes*: $(a^3 + b^3) = (a+b)(a^2 - ab + b^2)$

1) $x^3 - 125$ 2) $64x^4 + x$ 3) $8x^3 - 27$

6.7 Permutations and Combinations

Factorial: 5! =

Permutation: (Order) ${}_n\mathrm{P}_r = \dfrac{n!}{(n-r)!}$

Combination: (Unordered) ${}_nC_r = \dfrac{n!}{r!(n-r)!} = \dfrac{{}_nP_r}{r!}$

1) $\dfrac{8!}{4!3!}$ 2) ${}_7\mathrm{P}_5$ 3) ${}_6C_4$ 4) ${}_4P_3 - {}_3C_2$

5) Ways to get 1st, 2nd, and 3rd from 6 contestants:

6) Ways to order 3 letter from the word **SUPER:**

7) Ways to choose 5 out of 8 people:

8) Amigos has 6 meats and 8 fillings to choose from. How many different burritos can you make that have 3 fillings?

9) Pizza Factory has 5 meats and 7 veggies to choose from. How many different pizzas could you make with at most 3 items?

6.8 Binomial Theorem

Pascal's Triangle:

1) $(x^2 - 4y)^5$

2) 3rd term of $(x+3)^8$

Chapter 7: Functions

7.6 Function Operations

$(f \pm g)(x) = f(x) \pm g(x)$	$(f \bullet g)(x) = f(x) \bullet g(x)$	$\left(\frac{f}{g}\right)(x) = \frac{f(x)}{g(x)}$	$(f \circ g)(x) = f(g(x))$

$f(x) = 4x - 3$	$g(x) = 7 - x$	$h(x) = x^2 - 2x$

1) $f(x) - g(x)$

2) $h(x) \bullet f(x)$

3) $\frac{f(x)}{g(x)}$

4) $g(f(x))$

5) $(h \circ g)(x)$

$f(x) = 4x - 3$	$g(x) = 7 - x$	$h(x) = x^2 - 2x$

6) $h(3) - g(-5)$

7) $(f \circ g)(-5)$

8) $h(f(3))$

9) $3f(x) - g(x) - 4$

7.7 Inverse Functions

1) $f(x) = 2x - 8$

Find: $f^{-1}(x)$

2) $g(x) = 3 - x$

Find: $g^{-1}(x)$