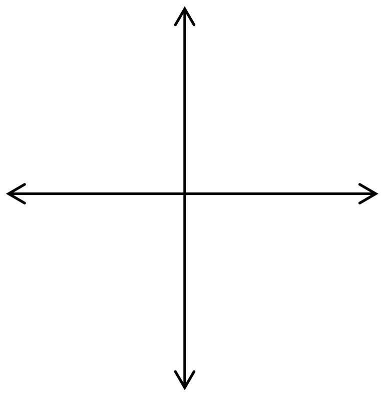
Algebra III
Chapter 1 Note Packet

Name ____

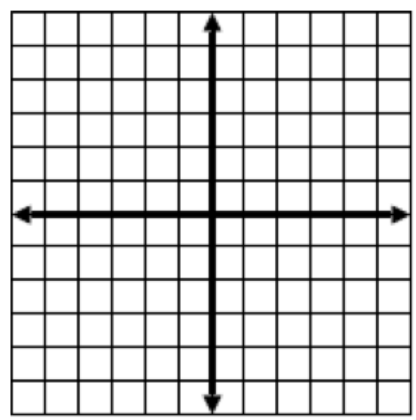
Section 1.1: Points and Lines

Essential Question:

The Coordinate Plane



LINEAR EQUATIONS

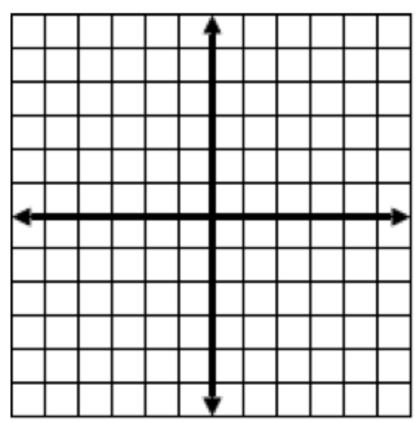


Standard or General Form:

Slope-intercept Form:

Slope =

INTERCEPTS of a LINEAR EQUATION

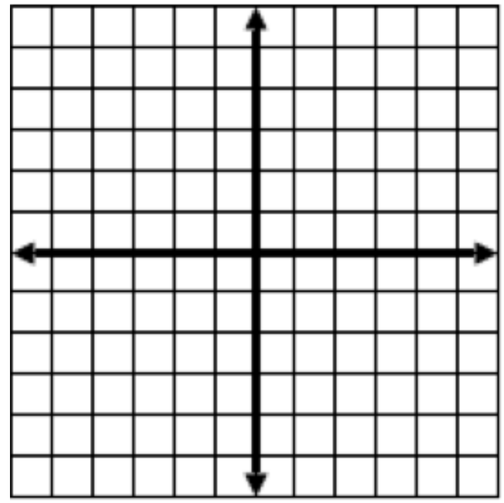


x – intercept: where the line crosses the __________
____

y – intercept: where the line crosses the __________
____

Example:
Graph $2x + 3y = 12$ using intercepts

To solve a SYSTEM of LINEAR EQUATIONS



To solve a system means to ______________________

____

Ways to solve a system:

1)

2)

3)

$3x - y = 4$

$5x + 3y = 9$

SPECIAL CASES for Systems of Linear Equations

No solution: ____

Infinitely many solutions: ____

REVIEW of Geometric information

Area of a triangle =

Parallelogram ____

____

____

DISTANCE and MIDPOINT FORMULAS

Midpoint:

Distance:

EXAMPLES: Find the coordinates of the midpoint and the length of $\overline{NM}$.
N (-1, 8) and M (3, 13)

Section 1.1 Summary:

Section 1.2: Slope of a line
Essential Question:

SLOPE

- Measures __________________ of a line in relation to the x-axis

- Slope =

- Slope is ___________________ (same value) between any ____ points

Examples
Find the slope of the line passing through the given points.

1) (2, -4) and (8, 3)

2) (-1, 5) and (3, 0)

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

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

SLOPE-INTERCEPT FORM

y = mx + b or y = mx + k

m = ____________ b = __________________

Example 5
What is the slope and y-intercept of 5x + 3y = -8 ?

Parallel Lines: ____

Perpendicular Lines: ____

Ex: If line A and line B are perpendicular and line A has m = -2 then line B has m = ____

Example 6

Which lines are parallel? Perpendicular? Or neither?

Line A	*Line B*	*Line C*
$y = \frac{3}{4}x + 5$	$4x + 3y = 3$	$3x - 4y = 5$

Section 1.2 Summary:

Section 1.3: Equations of lines

Essential Question:

***Standard Form**

***Slope-intercept Form**

***Point-Slope Form**

***Intercept Form**

Examples

Find an equation in standard form of the line described.

1) Line with slope of 5/3 and y-intercept of -2

2) Line that has x-intercept of -4 and y-intercept of 6

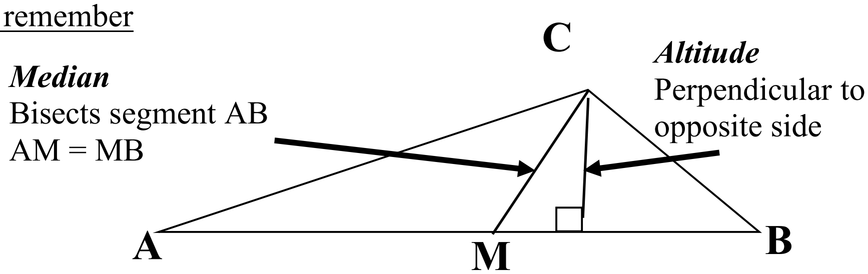
3) Line with a slope of 3 and passes through (-6, 3)

4) Line that passes through (2, 7) and is parallel to $y = \frac{1}{4}x \quad 6$

5) Line through (8, 3) and (2, -1)

6) Line that is ⊥ to $8x - 2y = 1$ and passes through (-4, -1)

Things to remember



Section 1.3 Summary:

Section 1.4: Linear Functions and Models

Essential Question:

A ____________________ describes a _________________ relationship between quantities.

For instance, the value of ______________ depends on the ____ - value.

Read as "____________ is a function of x"

This is written as:

f(   ) =

f(   ) =

f(   ) =

If f(**number**) = 0 then that **number** is called a _______________________________________.

Language

f(x) = 3x – 2 ____

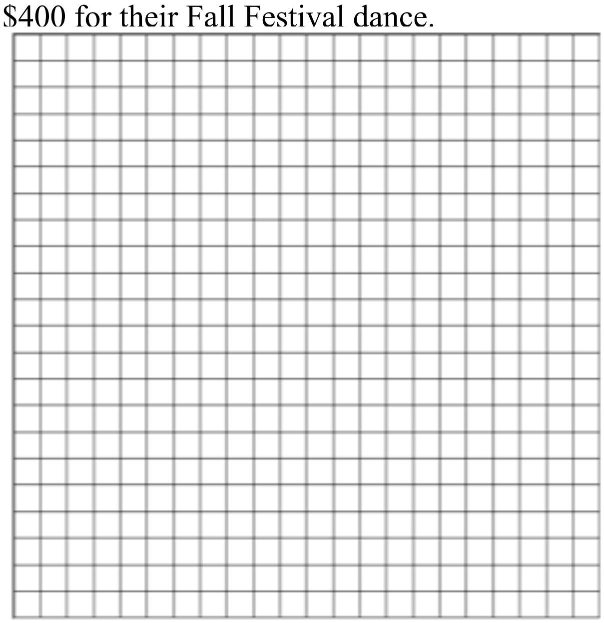
r(t) = .2t + 23 ____

Example

The senior class is renting the LaCrosse Center Ballroom for $400 for their Fall Festival dance. Tickets for the dance are $8 per person.

a) Express the net income (*I*) as a function of the number (*n*) of tickets sold.

b) Graph the function. How many tickets must be sold for the seniors to begin making a profit?



Section 1.4 Summary:

Section 1.5: Complex Numbers
Essential Question:

Real Numbers
Represented by a ___________________
Divided into __________________ numbers and ____________________ numbers
Every number is a real number!

Complex Numbers
Have the form ___________

a = _________________ b = _________________ i = __________________

Ex:

Pure Imaginary Numbers
When a = ______ (no real part)

Ex:

Examples:
Rewrite as a complex number.

1) $\sqrt{-36}$

2) $\sqrt{-15}$

3) $\sqrt{-3}\sqrt{-6}$

Simplify.

4) (6 – 5i) + (9 + 7i)

5) (7+ 3i)(4 – i)

6) $(8 - 5i)(8 + 5i)$

7) $(8 - 5i) + (8 + 5i)$

Conjugates

In the form _______________ and ______________

Sum is a ___________ number

Product is _________________________ real number

Examples:

8) $\frac{1}{3-4i}$

9) $\frac{8}{i}$

10) $\frac{5+2i}{3+i}$

11) i^2

i^3

i^4

i^5

i^6

i^7

12) i^{-4}

Equal Complex Numbers

a + bi and c + di are equal if…

a = c and b = d

Ex13) Find the value of x and y.

$2x + y + (3 - 5x)i = 1 - 7i$

Section 1.5 Summary:

Section 1.6: Quadratic Equations

Essential Question:

Quadratic Equations

- Standard form ________________________
- Solutions are called ___________ or ____________
- 3 methods to solve quadratic equations…

1)

2)

3)

Examples

Factor.

1) $x^2 - 5x - 14 = 0$

2) $16m^2 - 24m = 0$

3) $(3x - 2)(x + 4) = -11$

Section 1.6: How To Complete The Square

Step 1: Given $ax^2 + bx + c = 0$ Move 'c' to the other side of the equation
The equation should now look like the following…

$$x^2 + bx + \square = c + \square$$

Step 2: The a-value must be 1
If the a-value is NOT 1 then factor the 'a' value

Step 3: Now complete the square $\square$

You do so by $\frac{b}{2}^{2}$ Now your equation should look like …

$$x^2 + bx + \frac{b}{2}^{2} = c + \frac{b}{2}^{2}$$

Step 4: Factor the left side of the equation

You will go from $x^2 + bx + \frac{b}{2}^{2}$ to $x+\frac{b}{2}^{2}$

These are the same thing! Check by FOILing $x+\frac{b}{2}^{2}$

$$= x+\frac{b}{2} \quad x+\frac{b}{2} = x^2 + 2x\frac{b}{2} + \frac{b}{2}^{2} = x^2 + bx + \frac{b}{2}^{2}$$

Step 5: Now to solve for x take the square root of both sides

$$x+\frac{b}{2}^{2} = c+\frac{b}{2}^{2} \longrightarrow \sqrt{x+\frac{b}{2}^{2}} = \sqrt{c+\frac{b}{2}^{2}} \longrightarrow x+\frac{b}{2} = \pm\sqrt{c+\frac{b}{2}^{2}}$$

Here the square^2 and $\sqrt{\ }$ cancel

Step 6: Use basic algebra to get 'x' by itself

<u>EXAMPLE</u>

4) $x^2 - 10x + 14 = 0$

Solve by completing the square:

5) $m^2 + 8m = -30$

6) $4w^2 – 8w – 32 = 0$

Quadratic Formula

X =

when $ax^2 + bx + c = 0$

Examples

Solve using the quadratic formula.

7) $4x^2 – x – 7 = 0$

8) $y^2 + 10y + 35 = 0$

9) $m^2 = 10m – 25$

10) $8x^2 = 7 – 10x$

Discriminant

The quantity beneath the $\sqrt{}$ = ______________

Determines if solutions are real or imaginary

Value of Discriminant	Nature of Roots
$b^2 - 4ac = 0$	
$b^2 - 4ac < 0$	
$b^2 - 4ac > 0$	

Be careful… do NOT cancel binomials by dividing ➔ ___________________________

11) $2(x - 3) = (x - 3)^2$

Be Careful… when you square both sides of an equation ➔ __________________________

12) $\sqrt{3x+6} = 2x+1$

Be careful… when you have denominators ➔ __________________________________

13) $$\frac{x+2}{x-2} + \frac{x-2}{x+2} = \frac{8-4x}{x^2-4}$$

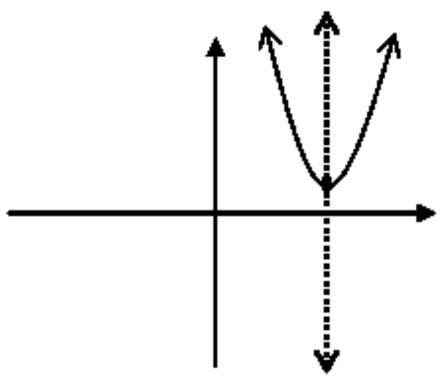
Section 1.6 Summary:

Section 1.7: Quadratic Functions and their Graphs

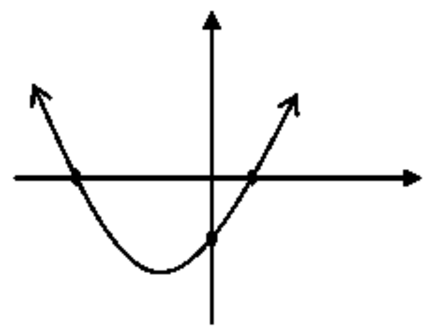
Essential Question:

-Form is $f(x) = ax^2 + bx + c, a \neq 0$
-Graph satisfies $y = ax^2 + bx + c$
-Graph is called a ___________________

Labels/Terminology



Intercepts

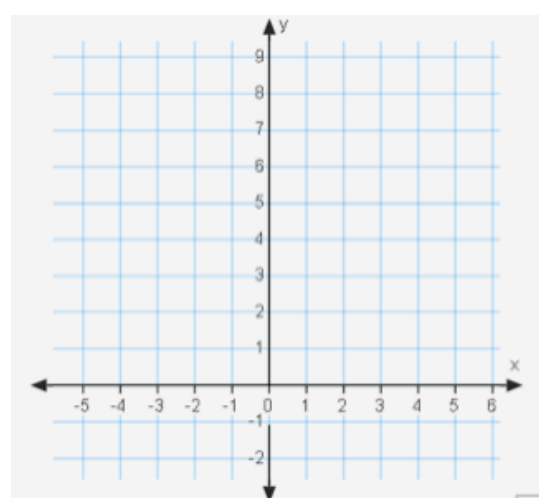


a-value	**Opening**	**Vertex**
$a > 0$		
$a < 0$		

Parent Graph: $y = x^2$

$y = 3x^2$

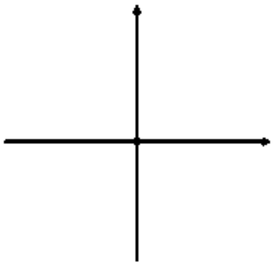
$y = \frac{1}{2} x^2$

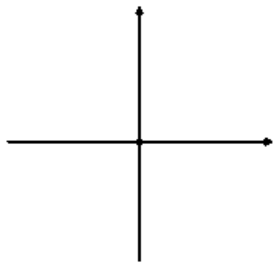


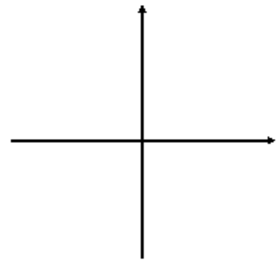
Note: The bigger ___________________ the more

__________________ the parabola

Number of Roots







2 real roots

$b^2 - 4ac > 0$

2 imaginary roots

$b^2 - 4ac < 0$

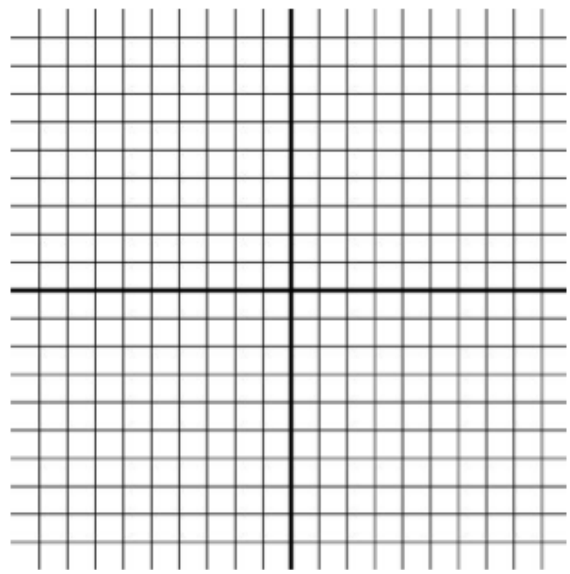
1 real root

$b^2 - 4ac = 0$

Example 1

Find the intercepts, A.O.S., and vertex of the parabola. Sketch the graph and label.

$$y = x^2 - 4x - 5$$



x-intercepts

y-intercepts

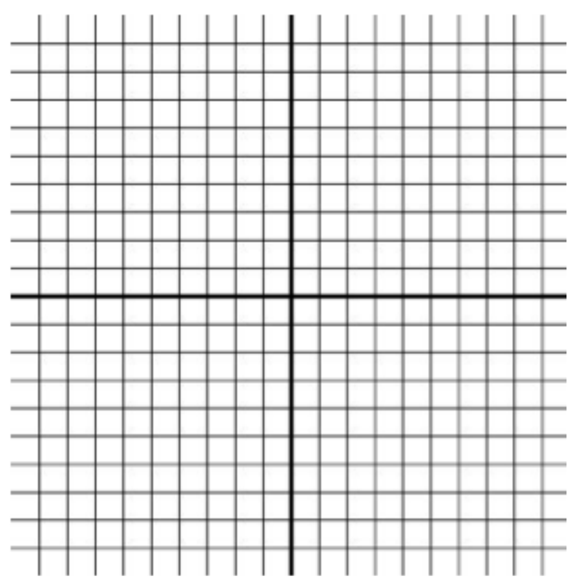
AOS

Vertex

Example 2

Find the intercepts, A.O.S., and vertex of the parabola. Sketch the graph and label.

$$y = x^2 - 2x - 5$$



x-intercepts

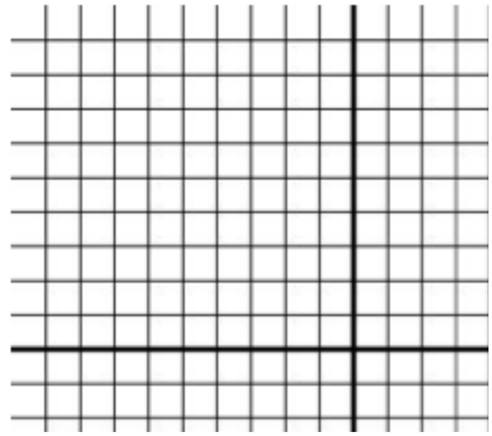
y-intercepts

AOS

Vertex

Another Way To Graph: $y = a(x - h)^2 + k$ Vertex: ____________
A.O.S: _____________

<u>Example 3</u>
Graph and label: $y = x^2 + 4x + 9$



Vertex

AOS

y-intercepts

x-intercepts

Methods of Graphing Parabolas

Method #1: AOS: and Vertex:

(plug in x-value & solve for y-value)

Method #2: $y = a(x - h)^2 + K$ Vertex:
AOS:

*Note: $y = ax^2 + bx + c$ the y-intercept is always the c-value

Section 1.7 Summary:

Section 1.8: Quadratic Models
Essential Question:

When to use a quadratic model:

*Values decrease and then increase

*Values increase and then decrease

* V = SA =

EXAMPLE #1

Use the given values to find an equation of the form $f(x) = ax^2 + bx + c$.

$f(1) = 4$, $f(2) = 12$, $f(4) = 46$

EXAMPLE #2

In an electric circuit, the available power P in watts when a current of I amperes is flowing is given by $P = 110I - 11I^2$.

If you were to plot coordinates (,   )

Sketch of parabola

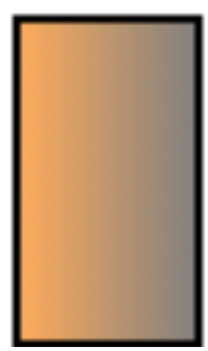
a. If the current is increased from 2 amperes to 3 amperes, by how much will the power increase?

b. Find the maximum power that can be produced by the circuit.

EXAMPLE #3

An object thrown into the air with an initial velocity (v_0) meters per second from a height (h_0) meters above ground is modeled by the function $h(t) = -4.9t^2 + v_0t + h_0$ (model does not account for air resistance). The height of the object will be h(t) after t seconds.

A ball is tossed with an upward velocity of 16 m/s from a building 20m high.



a. Find its height above the ground t seconds later.

b. When will the ball reach its highest elevation?

c. When will it hit the ground?

Section 1.8 Summary: