Use the graphing calculator to find the vertex.

$y = 2x^2 + 12x + 13$

Vertex $(-3, -5)$

Another Form of this Eq is:

$y = 2(x+3)^2 - 5$

$y = -3x^2 + 48x - 181$

Vertex $(8, 11)$

Another Form of this Eq is:

$y = -3(x - 8)^2 + 11$

Notice the connection to the coordinates of the vertex and this other equation of the quadratic.

What is the Vertex of each quadratic:

1. $y = 4(x - 7)^2 - 23$

Vertex: $(7, -23)$

2. $y = -3(x + 11)^2 + 5$

Vertex: $(-11, 5)$

Remember this?!

$$y = a|x - h| + k$$

a : $a>0$ opens up or $a<0$ opens down

$a>1$ Vertical Stretch $0<a<1$ Vertical Shrink

h: Horizontal Translation

k: Vertical Translation

Vertex: (h,k)

In general, if the function $y = f(x)$ is transformed the following way:

$y = a\,f(x - h) + k$

The parent function has been:

- Streched/Shrunk vertically by a factor of a
- Reflected over x-axis if $a<0$
- Translated horizontally h units.
- Translated vertically k units.

Section 5-3:

Transforming Parabolas

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

a : a>0 opens up or a<0 opens down

a>1 Vertical Stretch 0<a<1 Vertical Shrink

h: Horizontal Translation

k: Vertical Translation

Vertex: (h,k)

$y = ax^2 + bx + c$ This is called

Standard Form of a Quadratic Function

What is a good name for this?

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

Vertex Form of a Quadratic Function

Describe the transformations shown in the equation and identify the vertex and the y-intercept of this quadratic:

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

- x + 2 2 units left
- \+ 7 7 units up
- Vertical stretch factor of 3 (3 times taller)
- \- Opens Down x-axis reflection (upside down)

Vertex: (-2, 7) LOS: x = -2

y-intercept: (0, -5)

Describe all transformations of the Parent Function $y=x^2$ this equation shows

$$y = -5(x + 9)^2 - 17$$

Neg
Upside Down
i.e.
Parabola opens down.

5
5 times tallIer than the Parent Function (Vertical Stretch Factor)

x+9
Parabola has shifted 9 units left

-17
Parabola has shifted 17 units down.

Write an equation of this quadratic which is a tranformation of the Parent Function $y=x^2$:

- ~~Twice as~~ tall than the parent function
- Moved 10 units right
- Moved 13 units down
- Opens Up

$$y=2(x-10)^2-13$$

Write an equation of this quadratic which is a tranformation of the Parent Function $y=x^2$:

- Vertex is the point (-4, -9)
- Half as tall as the parent function
- Opens Down

$$y=-\frac{1}{2}(x+4)^2-9$$

State the vertex of this parabola: $y = 6(x - 13)^2 + 5$

13 right

5 up

$$\boxed{(13, 5)}$$

You can now finish Hwk #7

Practice Sheet Sec 5-3

Rewrite this Vertex Form of a Quadratic equation into Standard Form:

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

$$-4(x^2 + 6x + 9) + 11$$

	x	$+3$
x	x^2	$3x$
$+3$	$3x$	9

$$-4x^2 - 24x - 36 + 11$$

$$\boxed{-4x^2 - 24x - 25}$$

Use this Quadratic equation: $y = 7(x - 4)^2 - 10$

What is the Vertex of the parabola? $(4, -10)$

What is the equation for the LOS of this parabola? $x = 4$

What is the y-intercept of this parabola? $7(0-4)^2 - 10$

Make x=0 and find what y equals

$7(16)$

$112 - 10 = 102$

Graph this quadratic with at least five points

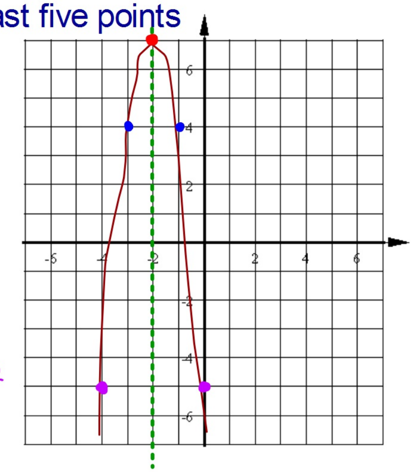
$y = -3(x + 2)^2 + 7$

Vertex is (-2,7)

LOS: x = -2

First good point: 1 x -3 → 1, -3

Second good point: 2 4 x -3 → 2, -12



You could also graph this parabola by first changing it into Standard Form.

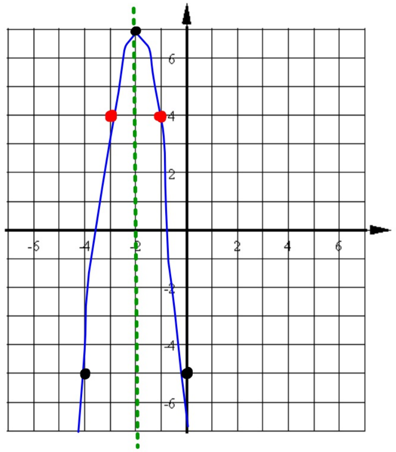
$$y = -3(x+2)^2 + 7$$
$$= -3(x^2 + 4x + 4) + 7$$
$$= -3x^2 - 12x - 12 + 7$$
$$= -3x^2 - 12x - 5$$

LOS $x = \frac{12}{2(-3)} = -2$

Vertex: $(-2, 7)$

y-int = -5

First good point: 1 x -3 → 1, -3



Graph this quadratic with at least five points

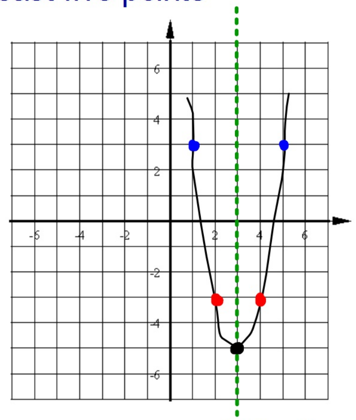
$$y = 2(x-3)^2 - 5$$

3 right 5 down makes the Vertex (3,5)

this parabola is twice as tall as the Parent Function and opens up.

1st good point: 1 x2 → 1, 2

2nd good point: 4 x2 → 2, 8



Write the equation of this parabola in Vertex Form.

Using the first "good" point to the right of the vertex we can tell that this parabola is twice as tall as the Parent Function

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

Using the vertex we know the graph has moved 3 left and 1 down