

March 17th

Due Today: HW 9.5

Due Tomorrow: HW 9.6

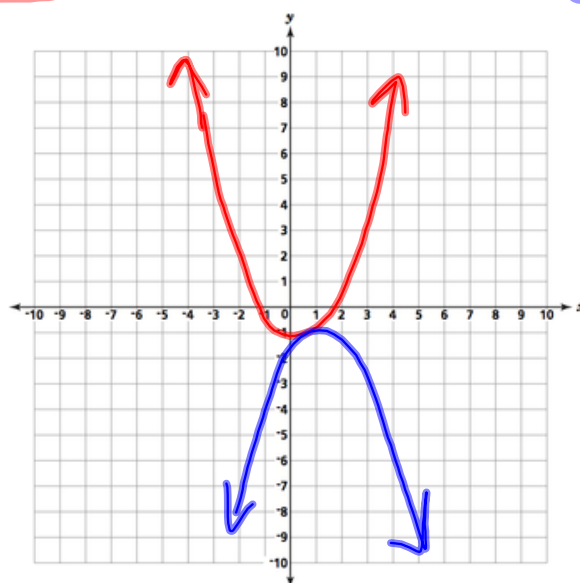
Unit 9: Quadratic Functions

Lesson 9.6: Can we find the vertex of a quadratic w/o graphing?

Get Ready: Use your graphing calculator to graph each of the following quadratics. **SKETCH** the graph in your notes.

1. $y = 3x^2 + 2x - 1$

2. $y = -3x^2 + 2x - 1$



$$y_1 = x^2$$

$$y_2 = 5x^2$$

$$y_3 = \left(-\frac{1}{5}\right)x^2$$

How does the A value impact the shape of the parabola?

• if a is $+$ Up like a Cup 

• if a is $-$ down like a frown 

if $|a|$ is > 1 - Narrow 

if $|a| < 1$ Wide 

How can we find the vertex of this parabola???

$$y = 3x^2 + 18x + 24$$

✂ HANDY DANDY FORMULA! ✂

$$x = \frac{-b}{2a}$$

This formula is for the x coordinate of the vertex!

How can we find the vertex of this parabola???

$$y = 3x^2 + 18x + 24$$

$$a = 3, b = 18, c = 24$$

Step 1: identify the a, b, c values

$$x = \frac{-b}{2a} = \frac{-18}{2(3)} = \frac{-18}{6} = \boxed{-3}$$

step 2: use the handy dandy formula to find the x-coordinate of the vertex

The x coordinate of the vertex

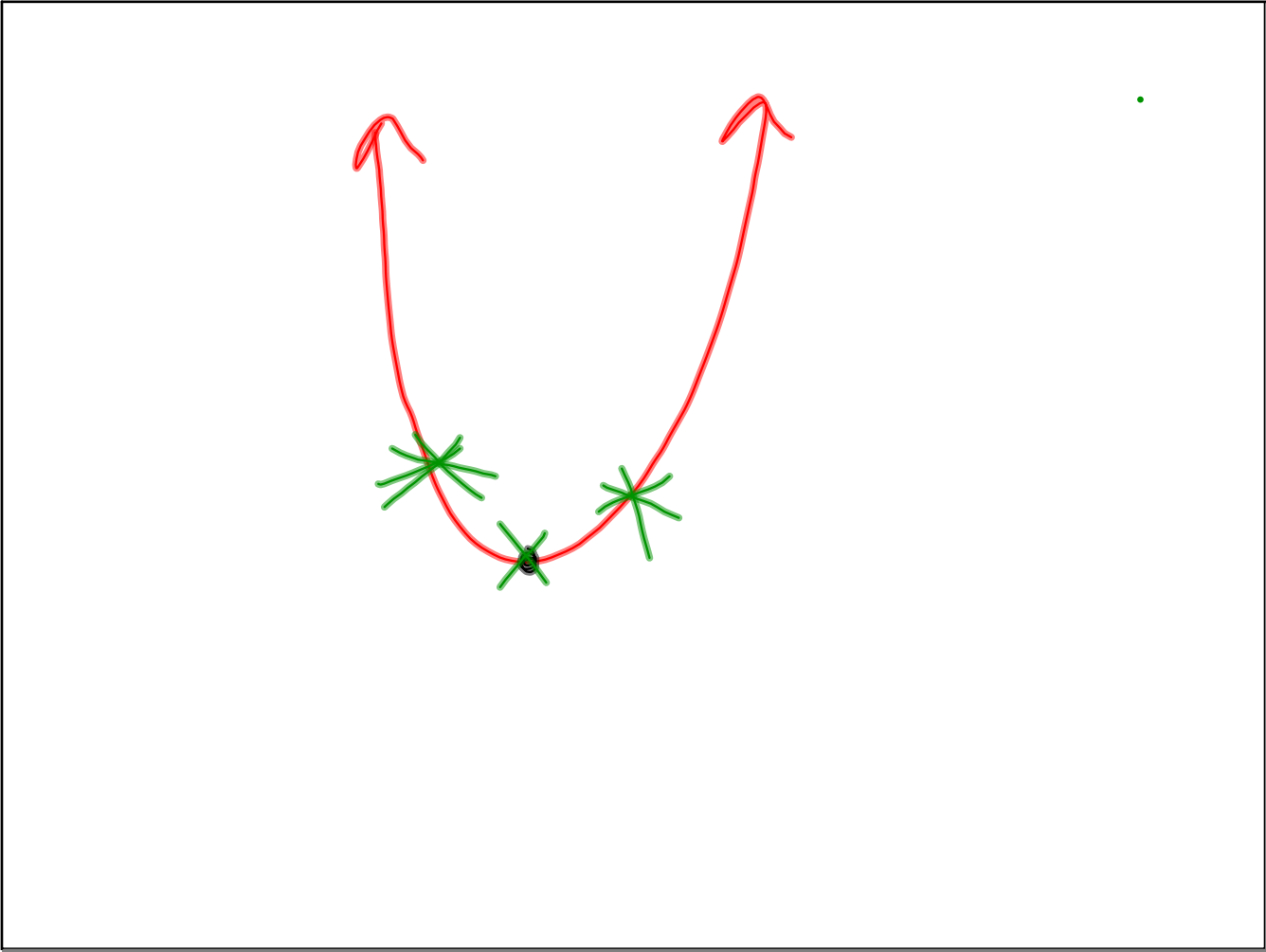
$$\begin{aligned} y &= 3x^2 + 18x + 24 \\ &= 3(-3)^2 + 18(-3) + 24 \\ y &= \boxed{-3} \end{aligned}$$

step 3: plug in the x value to get the y value

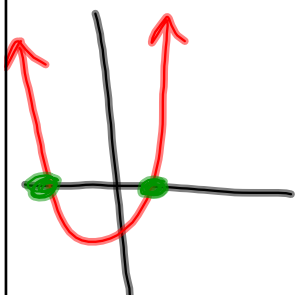
$$\text{Vertex: } (-3, -3)$$

Step 4: write out the vertex as a point

step 5: graph your parabola in your calculator to check if you're correct!



$$y = 3x^2 + 18x + 24$$



Can we find the roots?

plugin 0 for y
← Solve the Quad. Eq.

$$0 = 3x^2 + 18x + 24$$

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

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

$$\begin{array}{r} 4 \quad 6 \\ \times 2 \\ \hline 8 \quad 12 \end{array}$$

$$\cancel{3=0}$$

$$\begin{array}{l} x+4=0 \\ -4 \quad -4 \\ \hline x=-4 \end{array} \quad \begin{array}{l} x+2=0 \\ -2 \quad -2 \\ \hline x=-2 \end{array}$$

$$y = 3x^2 + 18x + 24$$

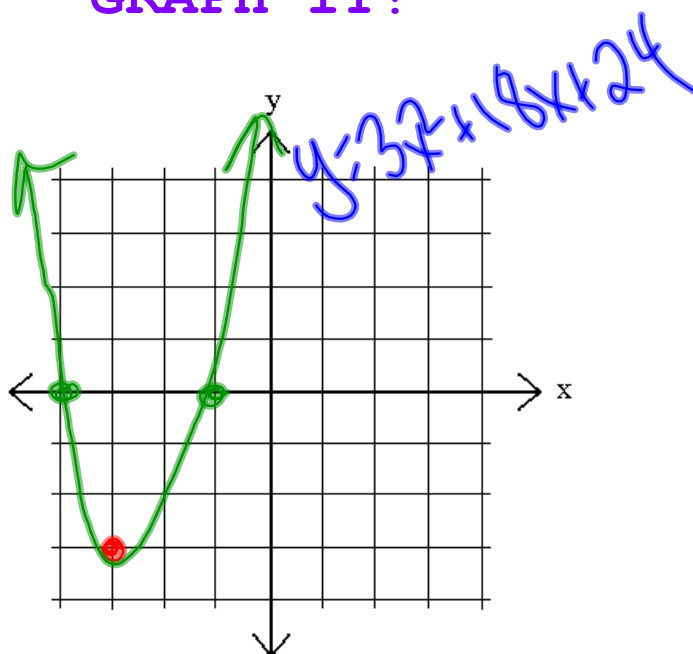
Can we find the axis of symmetry?

$$x = -3$$

x coordinate
of the vertex

If we have the vertex and the roots- what can we do??

GRAPH IT!



Find the Vertex, Roots and AoS of each parabola w/o graphing!

1. $y = 3x^2 + 6x$

2. $y = -x^2 + 2x - 4$

3. $y = x^2 + 8x + 12$

4. $y = x^2 - 6x$

If you finish early, go back and graph each of the parabolas and check w/ your calculator

Find the Vertex, Roots and AoS of each parabola w/o graphing!

1. $y = 3x^2 + 6x$

$$x = \frac{-b}{2a} = \frac{-6}{2(3)} = \frac{-6}{6} = -1$$

$$y = 3(-1)^2 + 6(-1) = -3$$

Vertex: $(-1, -3)$

$$0 = 3x(x+2)$$

$$0 = 3x, 0 = x+2$$

$0 = x, -2 = x$: Roots

AoS: $x = -1$

2. $y = -x^2 + 2x - 4$

$$x = \frac{-b}{2a} = \frac{-2}{2(-1)} = \frac{-2}{-2} = 1$$

$$y = -(1)^2 + 2(1) - 4 = -3$$

Vertex: $(1, -3)$

Roots: $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

$$= \frac{-2 \pm \sqrt{2^2 - 4(-1)(-4)}}{2(-1)}$$

$$= \frac{-2 \pm \sqrt{4 - 16}}{-2}$$

$$= \frac{-2 \pm \sqrt{-12}}{-2}$$

NO
ROOTS

AoS: $x = 1$

3. $y = x^2 + 8x + 12$

$$x = \frac{-b}{2a} = \frac{-8}{2(1)} = \frac{-8}{2} = -4$$

$$y = (-4)^2 + 8(-4) + 12 = -4$$

Vertex: $(-4, -4)$

Roots: $0 = (x+2)(x+6)$

$x = -2, -6$

AoS $x = -4$

4. $y = x^2 - 6x$

RECAP: We can find the vertex, Roots + AOS algebraically!

HOMEWORK:

hw 9.6

NEXT TIME:

Mini Quiz

