

## Quadratics Review- Determining the Vertex &amp; the Zeros

The rules for quadratics in <b>Standard Form:</b>	The rules for quadratics in <b>Vertex Form:</b>
$f(x) = ax^2 + bx + c$ <p>To find the <b>vertex</b>:</p> $x = -\frac{b}{2a}$ <p>Then plug <math>-\frac{b}{2a}</math> in to find <math>y</math></p> <p>To find the <b>zeros</b>:</p> <p>Use the <i>Quadratic Formula</i>  <i>Complete the Square</i>  or <i>Factor</i></p>	$f(x) = a(x - h)^2 + k$ <p>To find the <b>vertex</b>:</p> <p>It's given to you in the equation: <math>(h, k)</math>  Remember, though: horizontal lies!</p> <p>To find the <b>zeros</b>:</p> <p>Just set the equation equal to zero and solve!</p>

Quadratic Equation	Determine the vertex	Solve. (Determine zeros/roots/x-intercepts)
<p><b>EXAMPLE</b></p> $f(x) = 3x^2 - 6x - 3$ <i>Standard form!</i>	$f(x) = 3x^2 - 6x - 3$ $x = -\frac{b}{2a} = \frac{-(-6)}{2(3)} = \frac{+6}{6} = 1$  <i>Plug in <math>x = 1</math> (<math>-\frac{b}{2a}</math>)</i> $f(1) = 3(1)^2 - 6(1) - 3 = 3(1) - 6 - 3$ $f(1) = 3 - 9 = -6$  Vertex: $\boxed{(1, -6)}$	$f(x) = 3x^2 - 6x - 3$ $0 = 3x^2 - 6x - 3$ $0 = \frac{3x^2}{3} - \frac{6x}{3} - \frac{3}{3}$ $0 = x^2 - 2x - 1$ <i>not factorable, so use either completing the square or the quadratic formula!</i> $0 = x^2 - 2x - 1$ $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ $= \frac{2(-2) \pm \sqrt{(-2)^2 - 4(1)(-1)}}{2(1)}$ $= \frac{-4 \pm \sqrt{4 + 4}}{2} = \frac{-4 \pm \sqrt{8}}{2} = \frac{-4 \pm \sqrt{4}\sqrt{2}}{2}$ $= \frac{-4 \pm 2\sqrt{2}}{2} = \boxed{-2 \pm \sqrt{2}}$
<p><b>EXAMPLE</b></p> $f(x) = -2(x - 3)^2 + 6$ <i>Vertex form!</i>	$f(x) = -2(x - 3)^2 + 6$  <i>Horizontal is a liar! <math>h = +3</math></i> <i>Vertical is straight up. <math>v = +6</math></i> Vertex: $\boxed{(3, 6)}$	$f(x) = -2(x - 3)^2 + 6$ $-2(x - 3)^2 + 6 = 0$ <i>Subtract 6 from both sides</i> $-2(x - 3)^2 = -6$ <i>Divide both sides by -2</i> $(x - 3)^2 = -3$ $\sqrt{(x - 3)^2} = \pm\sqrt{-3}$ $x - 3 = \pm i\sqrt{3}$ <i>Add 3 to both sides</i> $x = \boxed{3 \pm i\sqrt{3}}$
<p>1. <math>f(x) = (x - 3)^2 - 7</math></p>		

$$2. f(x) = -5x^2 + 20x + 25$$

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

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

$$5. f(x) = -(x + 2)^2$$