

**SKILL BUILDER #112: Finding the Vertex**

Find the vertex point of each parabola and write in vertex form  $y = a(x - h)^2 + k$ .

**EXAMPLES:**

Example 1)  $y = x^2 + 6x + 13$

Take half of the x's, make a square.

$6/2 = 3. 3^2 = 9.$

You need 9 tiles to complete the square.  
You have 13.

$13 - 9 = 4.$

You have 4 leftover tiles outside of the square.

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

Vertex: (-3,4)

Example 2)  $y = (x - 1)(x + 5)$

Find the zeroes/x-intercepts

$x = 1$  and  $x = -5$

The vertex is halfway between

$h = (1 + -5)/2 = -4/2 = -2$

Plug in "h" to get "k"

$K = (-2 - 1)(-2 + 5) = (-3)(3) = -9$

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

Vertex: (-2, -9)

**SET 1**

<p>1) <math>y = x^2 - 8x + 7</math>  <math>-\frac{8}{2} = -4</math>  <math>(-4)^2 = 16</math>  <math>7 - 16 = -9</math>  <math>(x - 4)^2 - 9</math>  V: (4, -9)</p>	<p>2) <math>y = x^2 + 6x + 4</math>  <math>\frac{6}{2} = 3</math>  <math>3^2 = 9</math>  <math>4 - 9 = -5</math>  <math>(x + 3)^2 - 5</math>  V: (-3, -5)</p>
<p>3) <math>y = x^2 + 10x + 7</math>  <math>\frac{10}{2} = 5</math>  <math>5^2 = 25</math>  <math>7 - 25 = -18</math>  <math>(x + 5)^2 - 18</math>  V: (-5, -18)</p>	<p>4) <math>y = x^2 - 20x + 1</math>  <math>-\frac{20}{2} = -10</math>  <math>(-10)^2 = 100</math>  <math>1 - 100 = -99</math>  <math>(x - 10)^2 - 99</math>  V: (10, -99)</p>

**SET 2**

<p>1) <math>y = (x+2)(x-6)</math>  <math>x = -2, x = 6</math>  <math>h = \frac{-2+6}{2} = \frac{4}{2} = 2</math>  <math>k = (2+2)(2-6)</math>  <math>(4)(-4) = -16</math>  <math>V: (2, -16), y = (x-2)^2 - 16</math></p>	<p>2) <math>y = 5(x+1)(x+3)</math>  <math>x = -1, x = -3</math>  <math>h = \frac{-1+(-3)}{2} = \frac{-4}{2} = -2</math>  <math>k = 5(-2+1)(-2+3)</math>  <math>5(-1)(1) = -5</math>  <math>V: (-2, -5), y = 5(x+2)^2 - 5</math></p>
<p>3) <math>y = -4(x-1)(x-10)</math>  <math>x = 1, x = 10</math>  <math>h = \frac{1+10}{2} = \frac{11}{2} = 5.5</math>  <math>k = -4(5.5-1)(5.5-10)</math>  <math>-4(4.5)(-4.5)</math>  <math>k = 81</math>  <math>V: (5.5, 81)</math>  <math>y = -4(x-5.5)^2 + 81</math></p>	<p>4) <math>y = -2(x+2)(x-8)</math>  <math>x = -2, x = 8</math>  <math>h = \frac{-2+8}{2} = \frac{6}{2} = 3</math>  <math>k = -2(3+2)(3-8)</math>  <math>-2(5)(-5) = 50</math>  <math>V: (3, 50) \quad y = -2(x-3)^2 + 50</math></p>

**SET 3**

<p>1) <math>y = x^2 - 10x - 1</math>  <math>\frac{-10}{2} = -5</math>  <math>(-5)^2 = 25</math>  <math>-1 - 25 = -26</math>  <math>(x-5)^2 - 26</math>  <math>V: (5, -26)</math></p>	<p>2) <math>y = 3(x-10)(x+2)</math>  <math>x = 10, x = -2</math>  <math>h = \frac{10+(-2)}{2} = \frac{8}{2} = 4</math>  <math>k = 3(4-10)(4+2)</math>  <math>3(-6)(6) = -108</math>  <del><math>y = 3(x-10)(x+2)</math></del>  <math>y = (x-4)^2 - 108</math>  <math>V: (4, -108)</math></p>
<p>3) <math>y = x^2 + 9x + 5</math>  <math>\frac{9}{2} = 4.5</math>  <math>(4.5)^2 = 20.25</math>  <math>5 - 20.25 = -15.25</math>  <math>y = (x+4.5)^2 - 15.25</math>  <math>V: (-4.5, -15.25)</math></p>	<p>4) <math>y = x(x-8)</math>  <math>x = 0, x = 8</math>  <math>h = \frac{0+8}{2} = \frac{8}{2} = 4</math>  <math>k = 4(4-8)</math>  <math>4(-4) = -16</math>  <math>y = (x-4)^2 - 16</math>  <math>V: (4, -16)</math></p>