

# VERTEX FORM

How to calculate the...

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

★ VERTEX	X-INTERCEPT(S)	Y-INTERCEPT
$(h, k)$  opposite of what you see in ( )	Plug $y=0$ or 2 <sup>nd</sup> calc intersect (set $y_2=0$ )	Plug $x=0$ or 2 <sup>nd</sup> calc value $x=0$

**Practice:** Calculate the key features of each equation.

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

Vertex:  $(5, 3)$

X-intercept(s):  $\emptyset$

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

$$-\frac{3}{2} = (x-5)^2$$

$( )^2 \neq -\#$

Y-intercept:  $(0, 53)$

$$2(0-5)^2 + 3 = 53$$

Open up or down?  
 up  
 $(a > 0)$

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

Vertex:  $(-4, 1)$

X-intercept(s):  $(-5.4, 0)$  &  $(-2.6, 0)$

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

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

$$x+4 = \pm\sqrt{2}$$

$$-4 \pm \sqrt{2}$$

Y-intercept:  $(0, -7)$

$$-\frac{1}{2}(0+4)^2 + 1 = -7$$

Open up or down?  
 down  
 $(a < 0)$



# Factored Form

How to calculate the...

$$y = a(x-p)(x-q)$$

Vertex	★ X-intercept(s)	Y-intercept
$x =$ average of $x$ int plug back in for $y$ or Max or Min on GE	$y = 0$ and solve or Solve $( ) = 0$ $( ) = 0$	$x = 0$ and solve or 2 <sup>nd</sup> calc value $x = 0$

**Practice:** Calculate the key features of each equation.

1.  $y = -\frac{1}{2}(x+3)(x-5)$

Vertex:  $(1, 8)$

max

$$\frac{-3+5}{2} = 1$$

$$-\frac{1}{2}(1+3)(1-5)$$

$$-\frac{1}{2}(4)(-4)$$

$$8$$

X-intercept(s):  $x = -3$   $x = 5$   $x+3=0$   $x-5=0$   
 $(-3, 0)$   $(5, 0)$

Y-intercept:  $(0, 7.5)$   $-\frac{1}{2}(3)(-5)$   $-\frac{1}{2}(-15)$

Open up or down?  
 $a < 0$  Down

2.  $y = \frac{3}{2}(x+1)(x+7)$

Vertex:  $(-4, -13.5)$

$$\frac{-1+7}{2} = -4$$

$$\frac{3}{2}(-4+1)(-4+7)$$

$$\frac{3}{2}(-3)(3)$$

$$-13.5$$

X-intercept(s):  $x = -1$   $x = -7$   $x+1=0$   $x+7=0$   
 $(-1, 0)$   $(-7, 0)$

Y-intercept:  $(0, 10.5)$   $\frac{3}{2}(1)(7)$   $\frac{3}{2}(7)$

Open up or down?  
 $a > 0$  Up



# Standard Form

$$y = ax^2 + bx + c$$

How to calculate the...

Vertex	X-intercept(s)	★ Y-intercept
$x = \frac{-b}{2a}$ plug back in for y or Max/Min on calc	$y = 0$ and use QF or 2nd calc intersect $(y_2 = 0)$	$x = 0$ ends up just being the c value or 2nd calc value $x = 0$

**Practice:** Calculate the key features of each equation.

1.  $y = 3x^2 - x - 4$

Vertex: min  
 $(.17, -4.1)$

X-intercept(s):  
 $y_2 = 0$   
 $(-1, 0)$  &  $(1.3, 0)$

Y-intercept:  $(0, -4)$   
 $\leftarrow \frac{3(0)^2 - 0 - 4}{}$

Open up or down?

$a > 0$  up

2.  $y = -x^2 - 6x - 8$

Vertex: max  
 $(-3, 1)$

X-intercept(s):  
 $y_2 = 0$   
 $(-4, 0)$  &  $(-2, 0)$

Y-intercept:  $(0, -8)$   
 $\leftarrow \frac{-0^2 - 6(0) - 8}{}$

Open up or down?

$a < 0$  Down



