

# Vertex Form

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

**Write the Equation Given the Graph:**

- 1) Find the vertex  $(h,k)$
- 2) Find another point on the parabola  $(x,y)$
- 3) Sub values for  $h,k,x,y$  into vertex form equation
- 4) Solve for  $a$
- 5) Write the equation by subbing in values for  $a,h$ , and  $k$  (not  $x$  and  $y$ )

**Sketch the Graph given the equation:**

- 1) Find the vertex  $(h,k)$
- 2) Make a table of values for 2 points to the right and left of the vertex
- 3) Plot the points
- 4) Connect the points forming a parabola
- 5) Label the vertex

# Factored Form

$$y=a(x-r)(x-s)$$

**Write the Equation Given the Graph:**

- 1) Find the x-intercepts  $(r$  and  $s)$
- 2) Find another point on the parabola  $(x,y)$
- 3) Sub values for  $r,s,x,y$  into vertex form equation
- 4) Solve for  $a$
- 5) Write the equation by subbing in values for  $r,s$ , and  $a$  (not  $x$  and  $y$ )

**Sketch the Graph given the equation:**

- 1) Find the x-intercepts  $(r$  and  $s)$
- 2) Find the axis of symmetry:  $x=(r+s)/2$
- 3) Use the axis of symmetry to find the y-coordinate of the vertex
- 4) Sketch the graph by plotting and labeling the x-intercepts and the vertex

'a'

Represents the vertical STRETCH or COMPRESSION

If  $a > 1$  or  $a < -1$  : vertically stretched by a factor of 'a'

If  $-1 < a < 0$  or  $0 < a < 1$ : vertically compressed by a factor of 'a'

If 'a' is positive, the parabola opens UP

If 'a' is negative, the parabola opens DOWN

'k'

Represents the VERTICAL translation

If  $k > 0$ : the parabola is translated 'k' units up

If  $k < 0$ : the parabola is translated 'k' units down

'h'

Represents the HORIZONTAL translation

If  $h > 0$ : The parabola is translated 'h' units to the right

If  $h < 0$ : The parabola is translated 'h' units to the left

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

VERTEX FORM

Usefulness of Vertex Form

The vertex of a parabola in vertex form is:

$$(h, k)$$

The axis of symmetry of a parabola in vertex form is:

$$x = h$$

$$y=a(x-r)(x-s)$$

The x-intercepts of a parabola in factored form are:

'r' and 's'

(r,0) and (s,0)

## Axis of Symmetry

**Remember:** The axis of symmetry goes through the midpoint of the line connecting the x-intercepts. Find the midpoint of the x-intercepts to find the axis of symmetry. (add the x-intercepts and divide by 2)

$$\text{Axis of symmetry: } x=(r+s)/2$$

# Factored Form

How do you find the vertex of a parabola in factored form?

**Remember:** the axis of symmetry is the x-coordinate of the vertex. Find the axis of symmetry by adding the x-intercepts and then dividing by 2. Use the axis of symmetry to find the y-coordinate of the vertex (plug it into the equation and solve for 'y')

How to write the equation of a parabola in factored form:

- 1) Find the x-intercepts: r and s
- 2) Find another point on the graph (x,y)
- 3) Plug values for r,s,x, and y into  $y=a(x-r)(x-s)$
- 4) Solve for a
- 5) Write the final equation by plugging in values for a,r, and s. Not x and y.