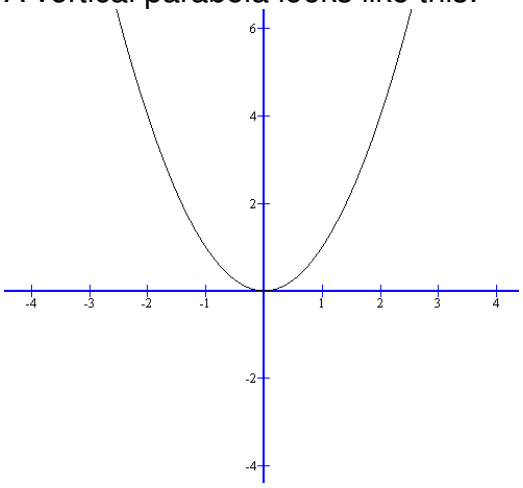
Vertical Parabolas

A vertical parabola looks like this:



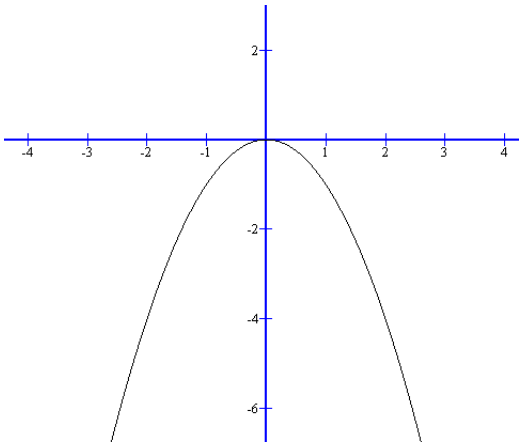
The basic equation for a vertical parabola is $y = x^2$

You can identify a vertical parabolic polynomial equation because:

1. The highest degree for y will be 1
2. The highest degree for x will be 2
3. You will be able to isolate the y term

If the x squared term is **positive**, the graph will be **right side up** (as above)

But, if the x squared term is **negative**, the graph will look **upside down** (as below)



From the equation of a parabola, we can also tell what the vertex is. The vertex is the point at the highest point of an upside down parabola or the lowest point of a right side up parabola.

For a parabolic equation: $y = ax^2 + bx + c$, the x coordinate for the vertex is $-\frac{b}{2a}$. The y coordinate can be found by plugging the x coordinate into the equation.

Example:

Find the vertex and orientation of the parabola given by the equation $y = -x^2 + 2x - 6$.

The x squared term is negative, so the parabola opens downward. The vertex is located at $x = -\frac{b}{2a} = \frac{-2}{-2} = 1$. For the y coordinate, we substitute $x = 1$ into the equation.

$$y = -(1)^2 + 2(1) - 6 = -1 + 2 - 6 = -5$$

The vertex is at: $(1, -5)$

Go through these problems and find the vertex and orientation of each parabola:

1. $y = -x^2$

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

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

4. $y = 3x^2 - x + 55$

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

6. $y = 3x^2$

7. $y = 4x^2 + 33x - 1$

8. $y = -7x^2 + 6x - 13$

9. $y = (x - 1)^2$

10. $y - x^2 + 2x - 1 = 0$