

## Graph of a Quadratic Function

$$y = ax^2 + bx + c, \text{ where } a \neq 0$$

- y - intercept (point where  $x = 0$ )

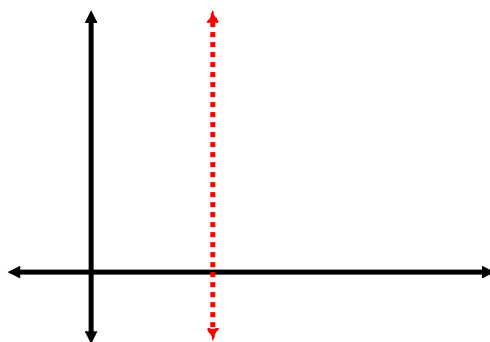
$$a(0)^2 + b(0) + c \text{ or } c$$

- Axis of symmetry

$$x = \frac{-b}{2a}$$

- x-coordinate of the Vertex

$$\frac{-b}{2a}$$

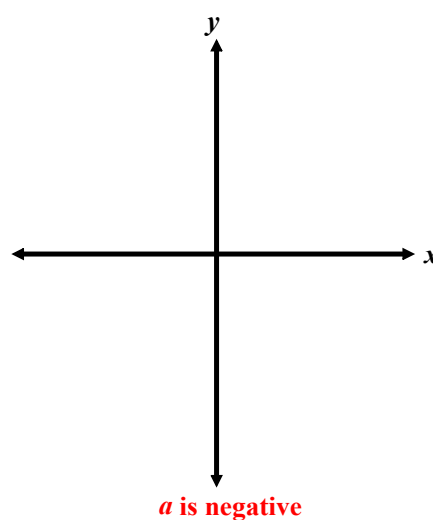
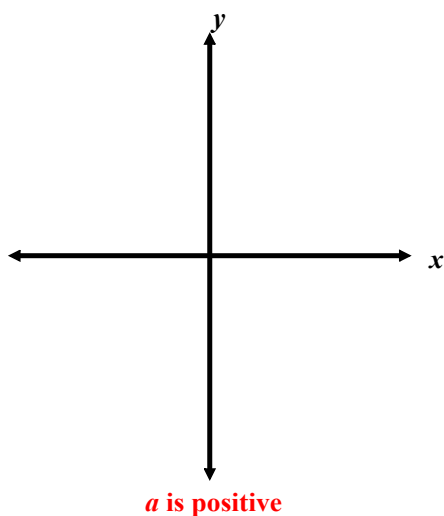


## Maximum and Minimum Values

The  $y$ -coordinate of the vertex is the max. or min.

$$f(x) = ax^2 + bx + c, \quad \text{where } a \neq 0$$


- Open UP and has a MINIMUM VALUE when  $a > 0$  ( $a$  is positive)
- Opens DOWN and has a MAXIMUM VALUE when  $a < 0$  ( $a$  is negative)



Example 3 - Maximum or Minimum

$$f(x) = -x^2 + 2x + 3$$

- Determine whether the function has a maximum or minimum value
  
- State the maximum or minimum value


$$f(x) = x^2 - 4x + 9$$

- Determine whether the function has a maximum or minimum value
  
- State the maximum or minimum value

