

# Vertex of the Quadratic

Given a quadratic  $r(x) = ax^2 + bx + c$  compute its value at

$$x_1 = -\frac{b}{2a} \text{ namely } r(x_1) = c - \frac{b^2}{4a}$$

Now compute the same quadratic at  $x_1+h$ , namely

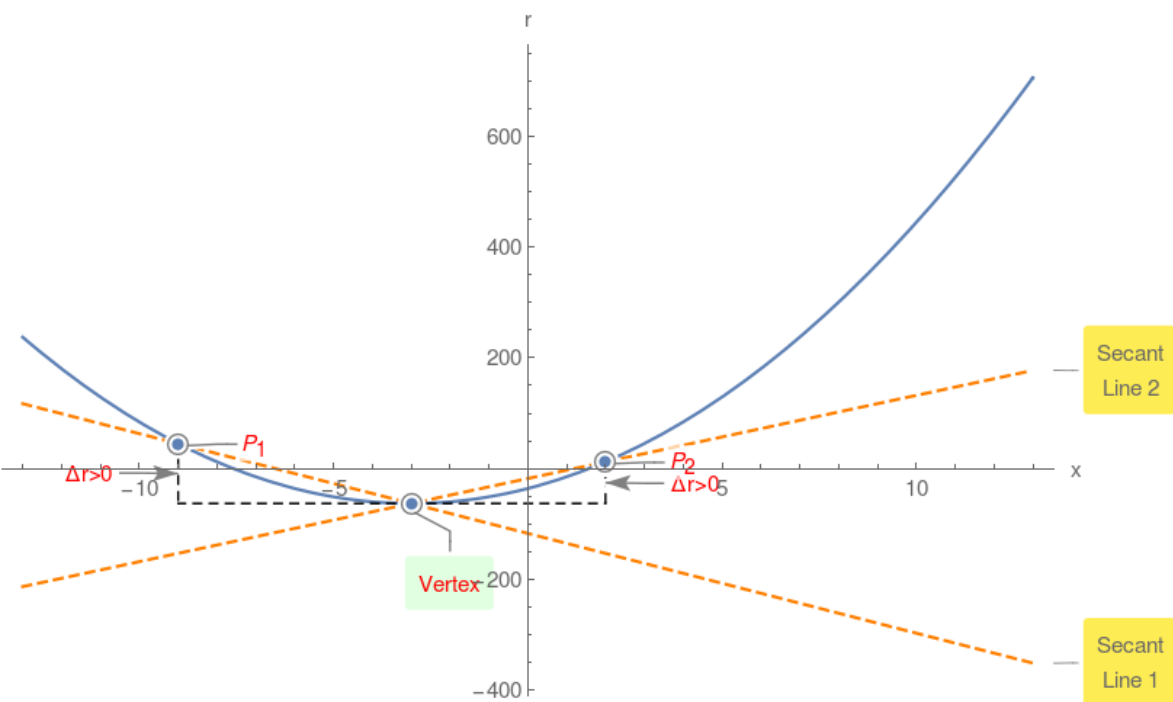
$$r(x_1+h) = -\frac{b^2}{4a} + ah^2 + c$$

$$\text{Compute } \Delta = r(x_1+h) - r(x_1) = ah^2$$

Since  $h^2 > 0$ , therefore if  $a > 0$  then  $\Delta > 0$  or vertex is the global minimum!

## Example 1.

$$r(x) = 3x^2 + 18x - 36$$



However if  $a < 0$  then  $\Delta < 0$  or vertex is the global maximum!

## Example 2.

$$r(x) = -x^2 + 8x + 58$$

