

# Vertex of the Quadratic

Given a quadratic  $b(d) = a d^2 + b d + c$  compute its value at

$$d_1 = -\frac{b}{2a} \text{ namely } b(d_1) = c - \frac{b^2}{4a}$$

Now compute the same quadratic at  $d_1+h$ , namely

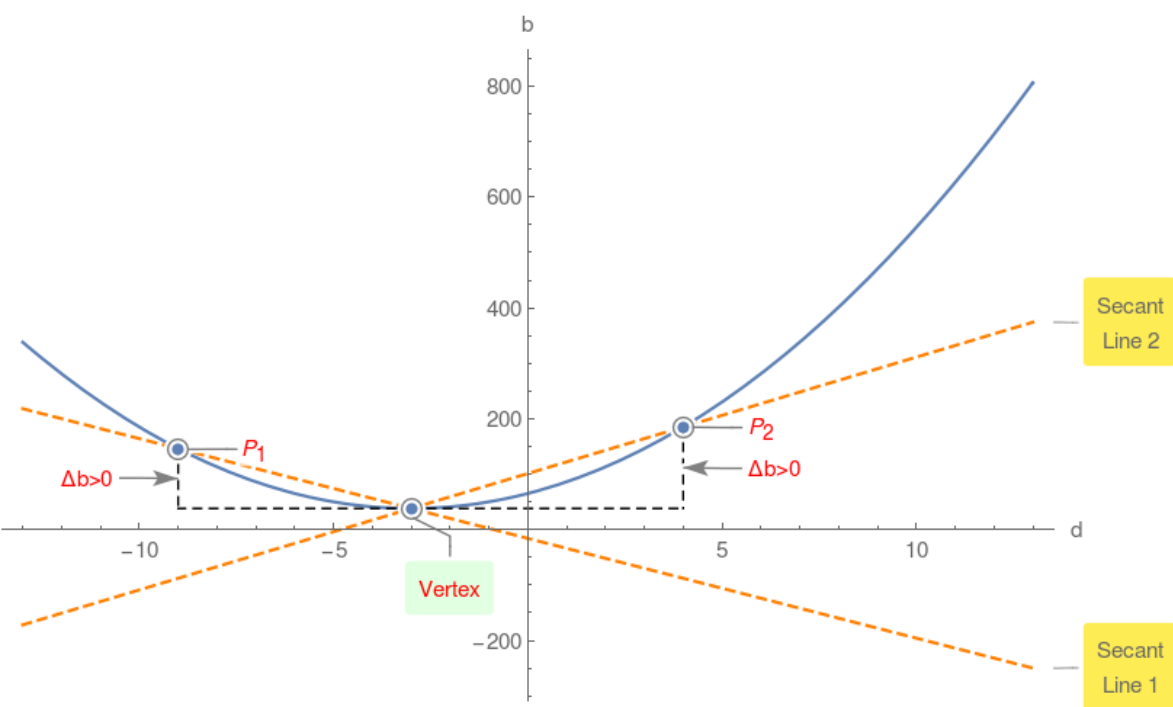
$$b(d_1+h) = -\frac{b^2}{4a} + a h^2 + c$$

$$\text{Compute } \Delta = b(d_1+h) - b(d_1) = a h^2$$

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

## Example 1.

$$b(d) = 3 d^2 + 18 d + 65$$



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

## Example 2.

$$b(d) = -2 d^2 - 4 d + 49$$

