

## Vertex of the Quadratic

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

$$s_1 = -\frac{b}{2a} \text{ namely } v(s_1) = c - \frac{b^2}{4a}$$

Now compute the same quadratic at  $s_1+h$ , namely

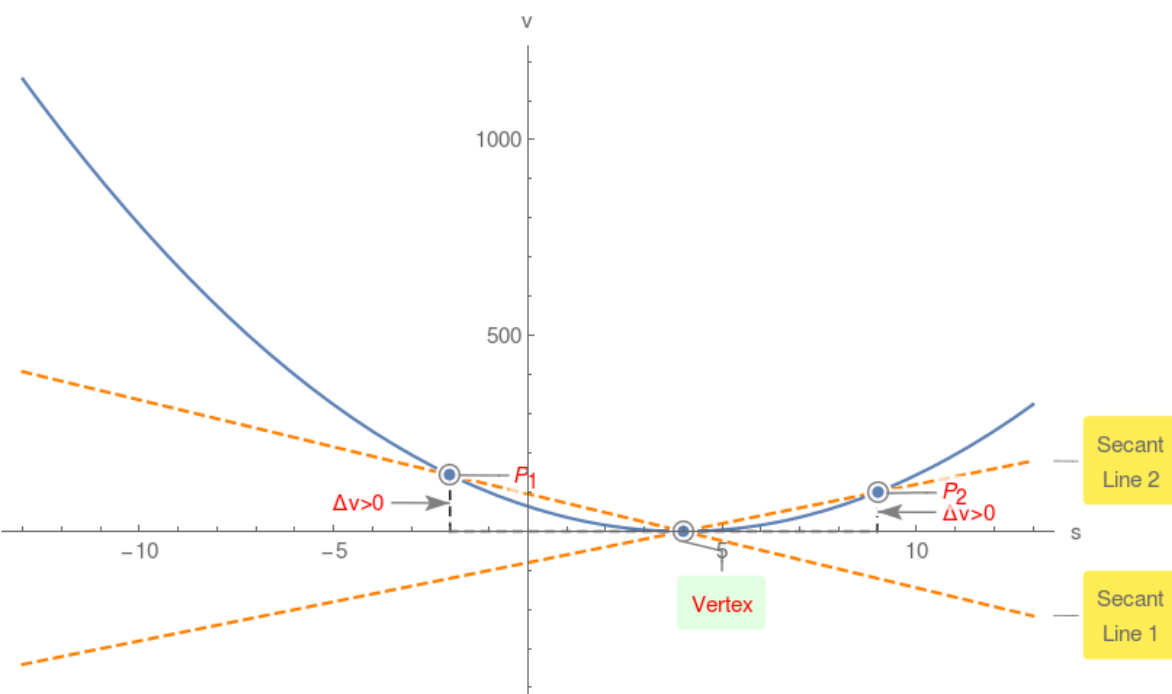
$$v(s_1+h) = -\frac{b^2}{4a} + a h^2 + c$$

$$\text{Compute } \Delta = v(s_1+h) - v(s_1) = a h^2$$

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

### Example 1.

$$v(s) = 4 s^2 - 32 s + 63$$



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

### Example 2.

$$v(s) = -4 s^2 - 24 s - 64$$

