

# Vertex of the Quadratic

Given a quadratic  $e(f) = af^2 + bf + c$  compute its value at

$$f_1 = -\frac{b}{2a} \text{ namely } e(f_1) = c - \frac{b^2}{4a}$$

Now compute the same quadratic at  $f_1+h$ , namely

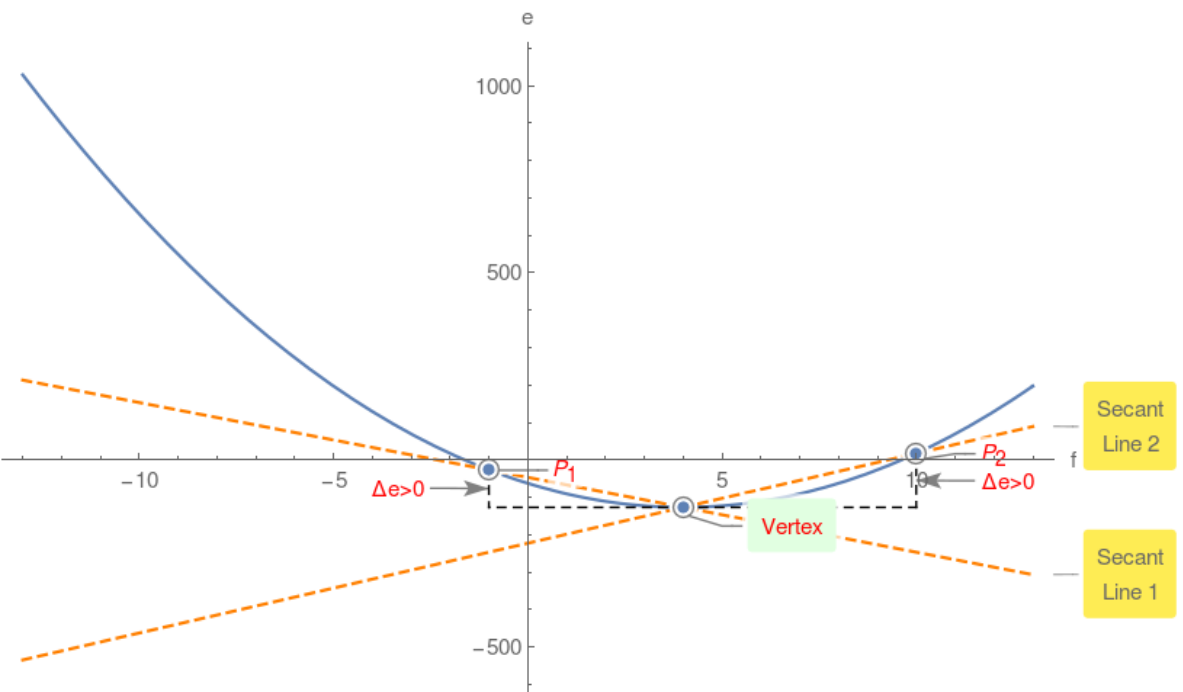
$$e(f_1+h) = -\frac{b^2}{4a} + ah^2 + c$$

$$\text{Compute } \Delta = e(f_1+h) - e(f_1) = ah^2$$

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

## Example 1.

$$e(f) = 4f^2 - 32f - 63$$



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

## Example 2.

$$e(f) = -4f^2 + 16f - 60$$

