Vertex of the Quadratic

Given a quadratic $e(y) = a\,y^2 + b\,y + c$ compute its value at $y_1 = -\frac{b}{2\,a}$ namely $e(y_1) = c - \frac{b^2}{4\,a}$

Now compute the same quadratic at $y_1 + h$, namely

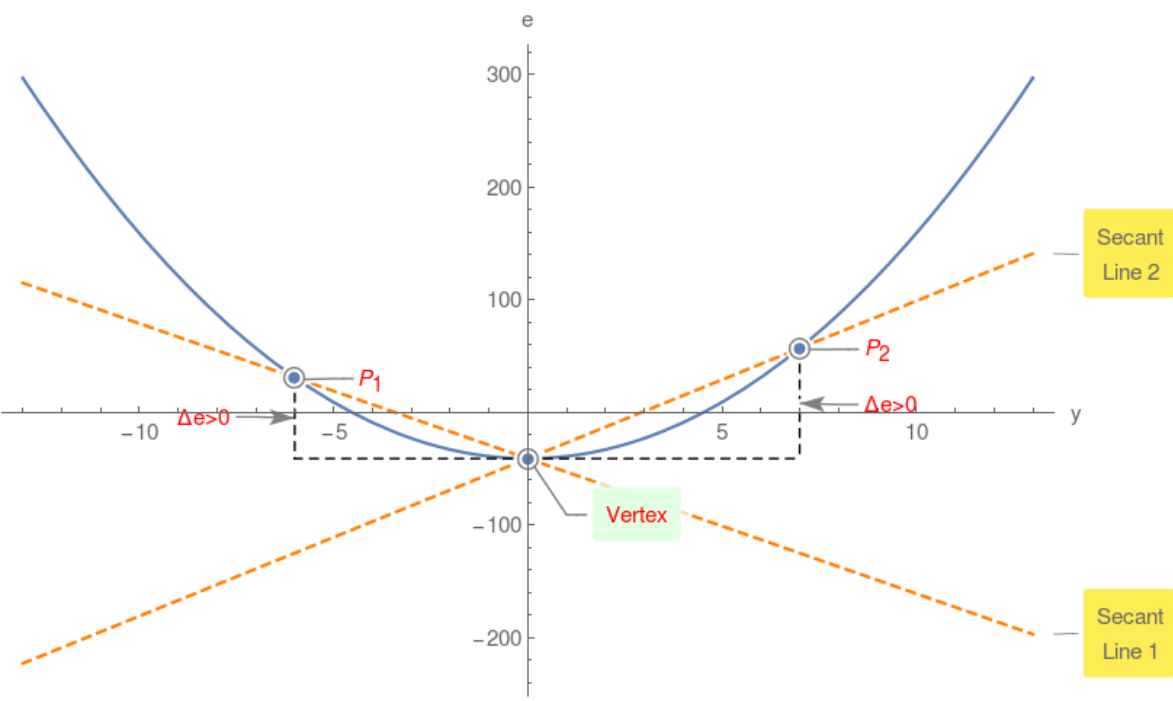
$e(y_1 + h) = -\frac{b^2}{4\,a} + a\,h^2 + c$

Compute $\triangle = e(y_1 + h) - e(y_1) = a\,h^2$

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

Example 1.

$e(y) = 2\,y^2 - 41$



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

Example 2.

$e(y) = -y^2 - 6\,y + 44$