Vertex of the Quadratic

Given a quadratic $x(e) = a\,e^2 + b\,e + c$ compute its value at $e_1 = -\frac{b}{2\,a}$ namely $x(e_1) = c - \frac{b^2}{4\,a}$

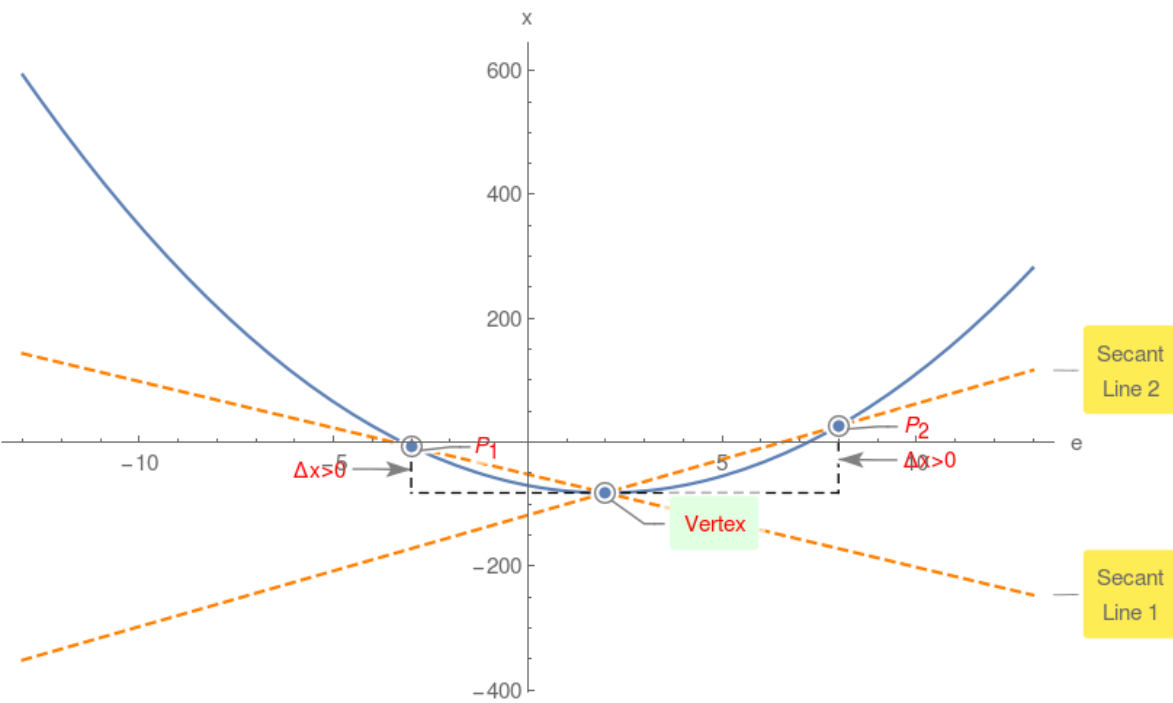
Now compute the same quadratic at $e_1 + h$, namely $x(e_1 + h) = -\frac{b^2}{4\,a} + a\,h^2 + c$

Compute $\triangle = x(e_1 + h) - x(e_1) = a\,h^2$

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

Example 1.

$x(e) = 3\,e^2 - 12\,e - 70$



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

Example 2.

$x(e) = -e^2 - 42$