Vertex of the Quadratic

Given a quadratic $e(n) = a\,n^2 + b\,n + c$ compute its value at

$n_1 = -\frac{b}{2a}$ namely $e(n_1) = c - \frac{b^2}{4a}$

Now compute the same quadratic at $n_1 + h$, namely

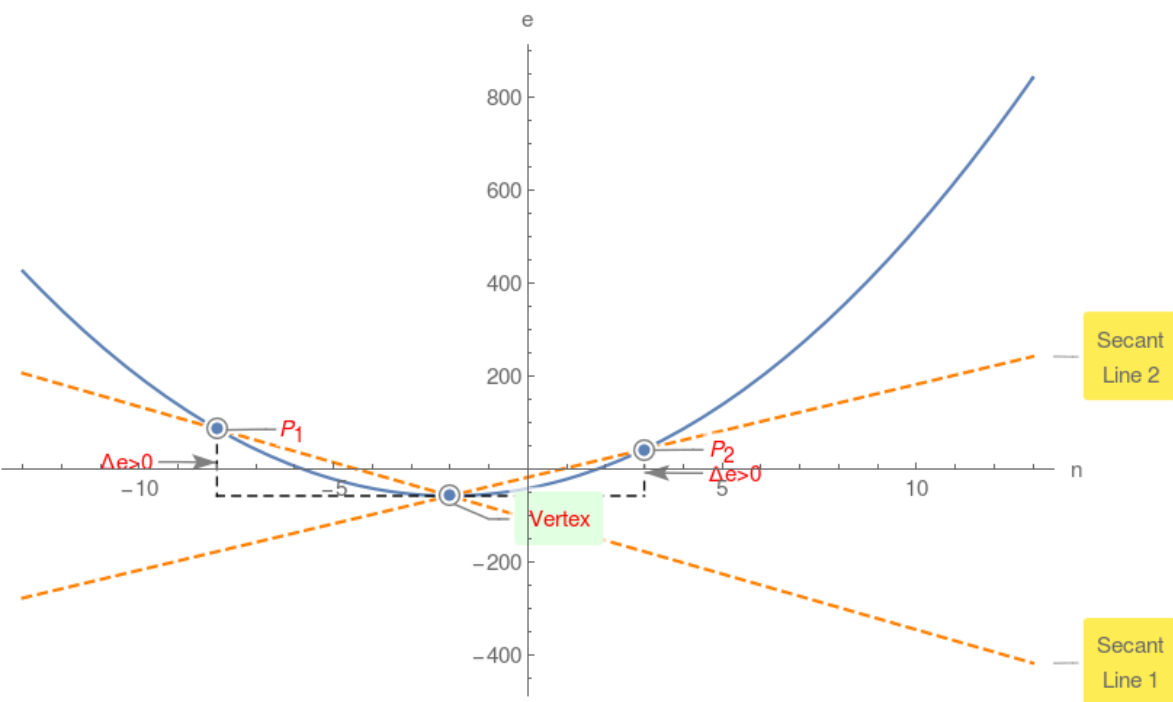$e(n_1 + h) = -\frac{b^2}{4a} + a\,h^2 + c$

Compute $\triangle = e(n_1 + h) - e(n_1) = a\,h^2$

Since $h^2 > 0$, therefore if $\boxed{a > 0}$ then $\triangle > 0$ or vertex is the

global minimum!

Example 1.
$e(n) = 4\,n^2 + 16\,n - 43$

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

Example 2.
$e(n) = -n^2 - 4\,n - 41$