Vertex of the Quadratic

Given a quadratic $e(m) = a\,m^2 + b\,m + c$ compute its value at $m_1 = -\frac{b}{2\,a}$ namely $e(m_1) = c - \frac{b^2}{4\,a}$

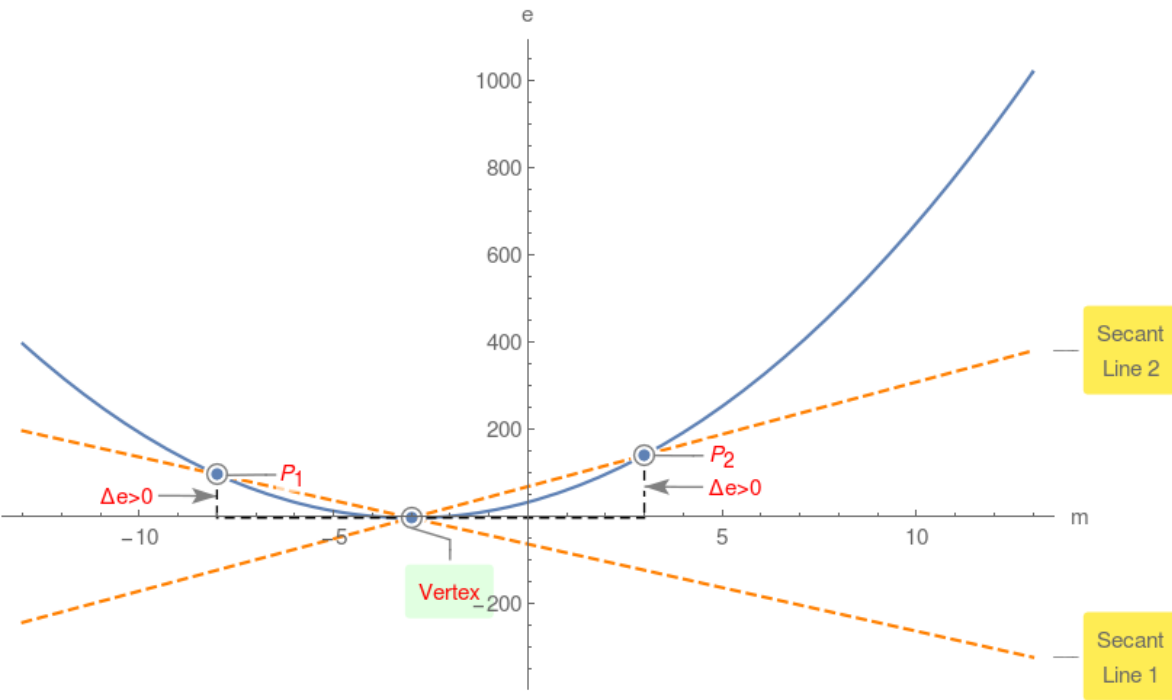
Now compute the same quadratic at $m_1 + h$, namely $e(m_1 + h) = -\frac{b^2}{4\,a} + a\,h^2 + c$

Compute $\triangle = e(m_1 + h) - e(m_1) = a\,h^2$

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

Example 1.

$e(m) = 4\,m^2 + 24\,m + 32$



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

Example 2.

$e(m) = -4\,m^2 + 16\,m - 51$