Vertex of the Quadratic

Given a quadratic $n(p) = a\,p^2 + b\,p + c$ compute its value at $p_1 = -\frac{b}{2\,a}$ namely $n(p_1) = c - \frac{b^2}{4\,a}$

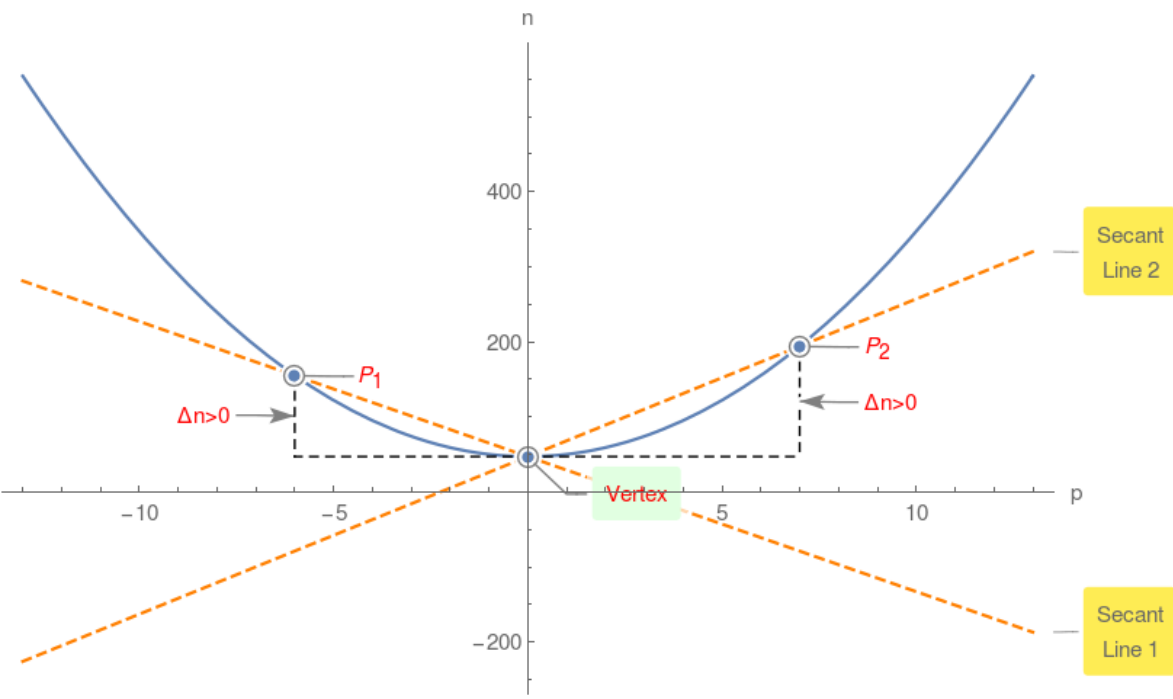
Now compute the same quadratic at $p_1 + h$, namely $n(p_1 + h) = -\frac{b^2}{4\,a} + a\,h^2 + c$

Compute $\triangle = n(p_1 + h) - n(p_1) = a\,h^2$

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

Example 1.

$n(p) = 3\,p^2 + 47$



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

Example 2.

$n(p) = -2\,p^2 - 12\,p - 55$