Vertex of the Quadratic

Given a quadratic $r(n) = a\,n^2 + b\,n + c$ compute its value at $n_1 = -\frac{b}{2\,a}$ namely $r(n_1) = c - \frac{b^2}{4\,a}$

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

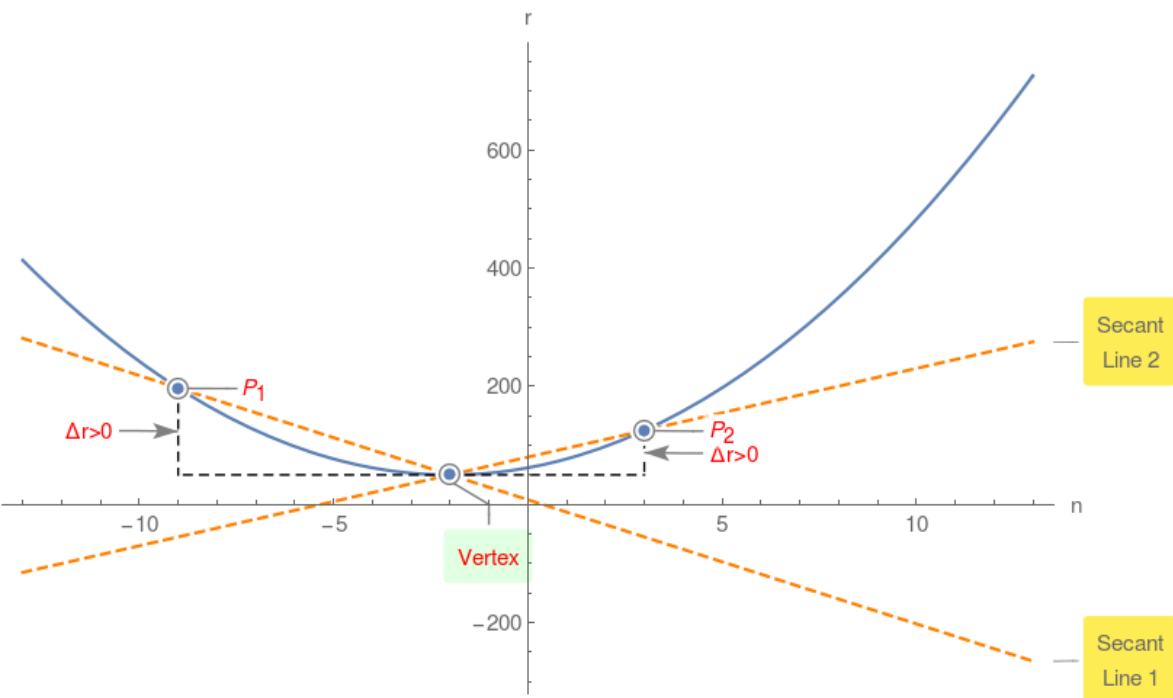
$r(n_1 + h) = -\frac{b^2}{4\,a} + a\,h^2 + c$

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

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

Example 1.

$r(n) = 3\,n^2 + 12\,n + 62$



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

Example 2.

$r(n) = -n^2 + 2\,n - 33$