Vertex of the Quadratic

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

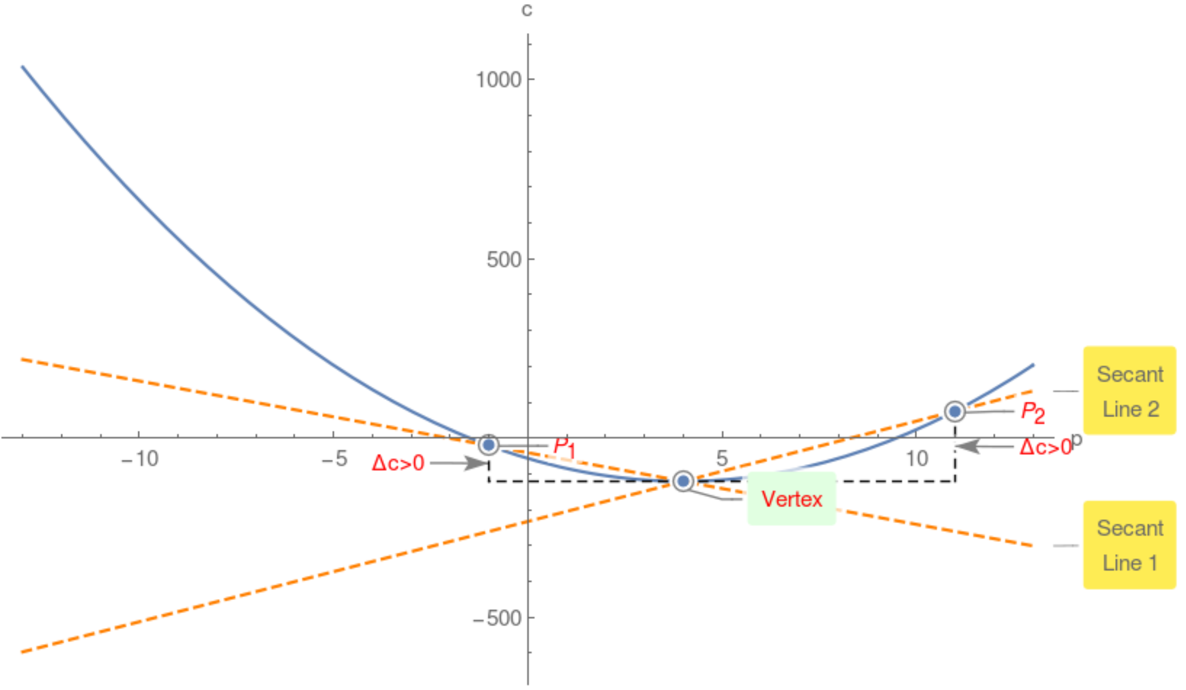
Now compute the same quadratic at $p_1 + h$, namely $c(p_1 + h) = -\frac{b^2}{4a} + a\,h^2 + c$

Compute $\Delta = c(p_1 + h) - c(p_1) = a\,h^2$

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

Example 1.

$c(p) = 4\,p^2 - 32\,p - 57$



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

Example 2.

$c(p) = -4\,p^2 - 8\,p - 44$