Vertex of the Quadratic

Given a quadratic $j(k) = a\,k^2 + b\,k + c$ compute its value at $k_1 = -\frac{b}{2\,a}$ namely $j(k_1) = c - \frac{b^2}{4\,a}$

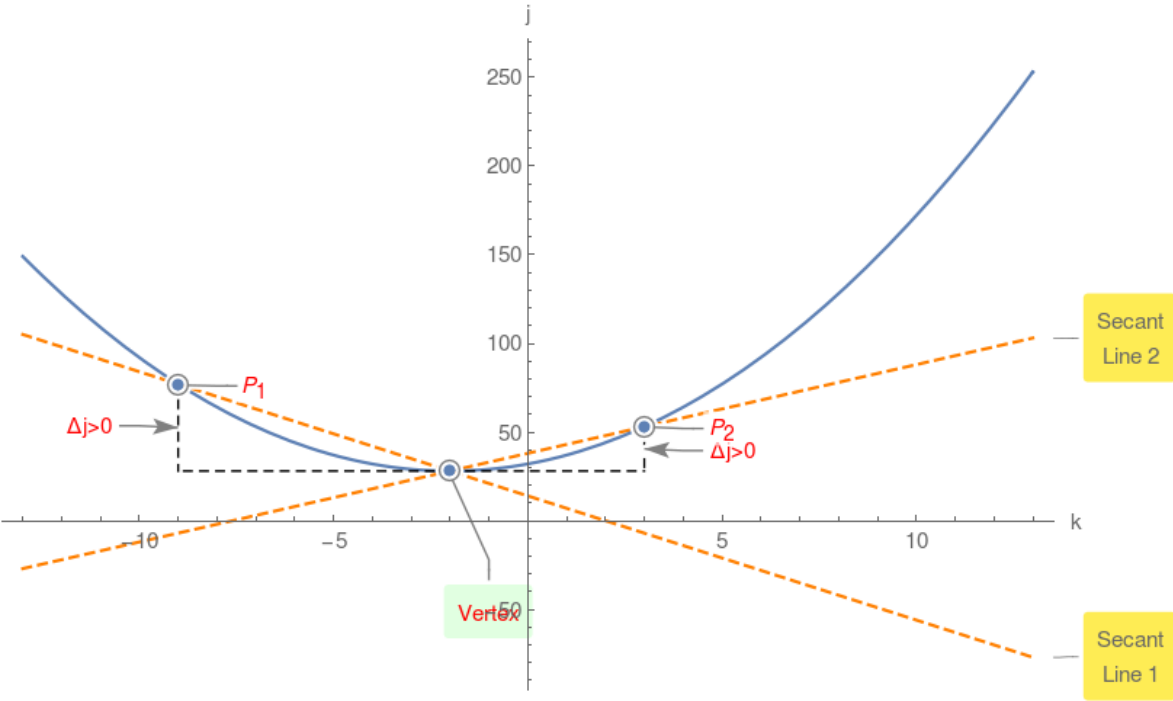
Now compute the same quadratic at $k_1 + h$, namely $j(k_1 + h) = -\frac{b^2}{4\,a} + a\,h^2 + c$

Compute $\triangle = j(k_1 + h) - j(k_1) = a\,h^2$

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

Example 1.

$j(k) = k^2 + 4\,k + 32$



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

Example 2.

$j(k) = -4\,k^2 - 8\,k + 42$