Vertex of the Quadratic

Given a quadratic $k(v) = a\,v^2 + b\,v + c$ compute its value at $v_1 = -\frac{b}{2\,a}$ namely $k(v_1) = c - \frac{b^2}{4\,a}$

Now compute the same quadratic at $v_1 + h$, namely

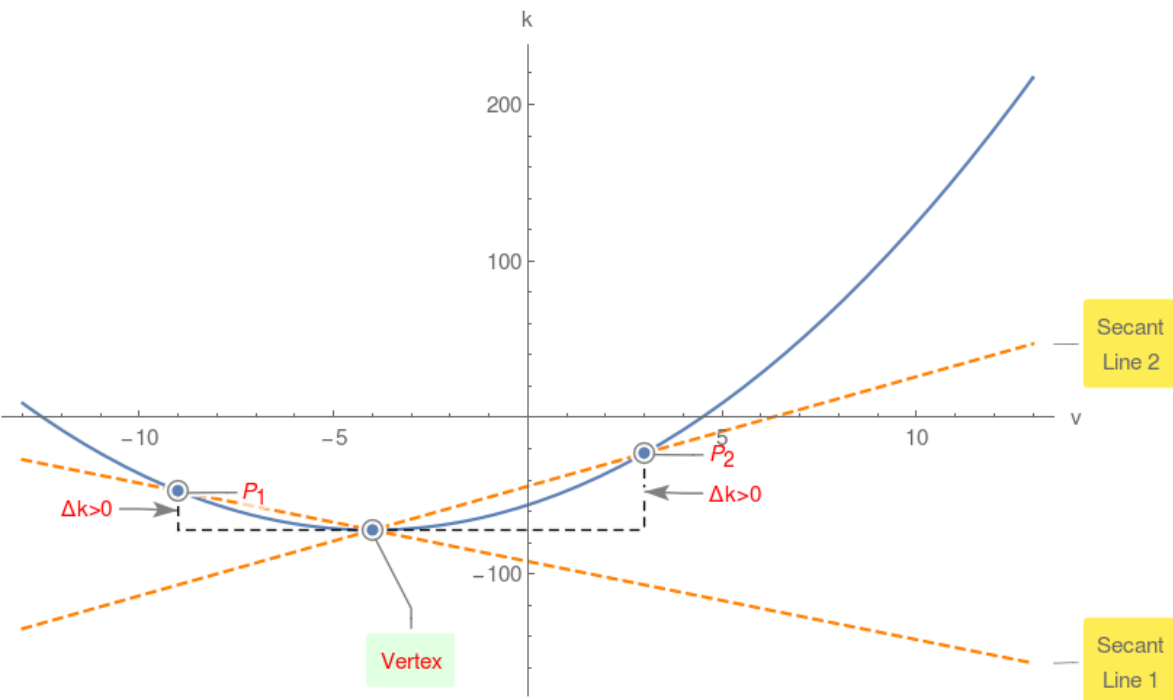
$k(v_1 + h) = -\frac{b^2}{4\,a} + a\,h^2 + c$

Compute $\triangle = k(v_1 + h) - k(v_1) = a\,h^2$

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

Example 1.

$k(v) = v^2 + 8\,v - 56$



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

Example 2.

$k(v) = 50 - 4\,v^2$