Vertex of the Quadratic

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

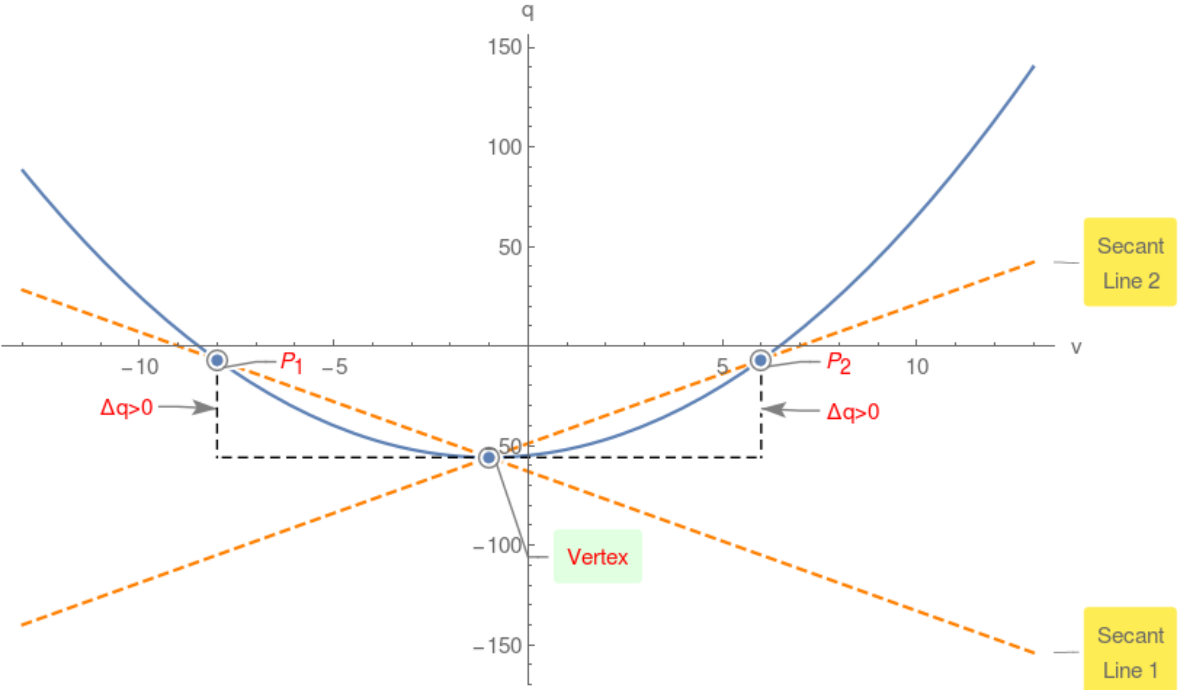
Now compute the same quadratic at v_1+h, namely $q(v_1+h) = -\frac{b^2}{4a} + a\,h^2 + c$

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

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

Example 1.

$q(v) = v^2 + 2\,v - 55$



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

Example 2.

$q(v) = -v^2 + 6\,v - 38$