Vertex of the Quadratic

Given a quadratic $b(g) = a\,g^2 + b\,g + c$ compute its value at $g_1 = -\frac{b}{2\,a}$ namely $b(g_1) = c - \frac{b^2}{4\,a}$

Now compute the same quadratic at $g_1 + h$, namely

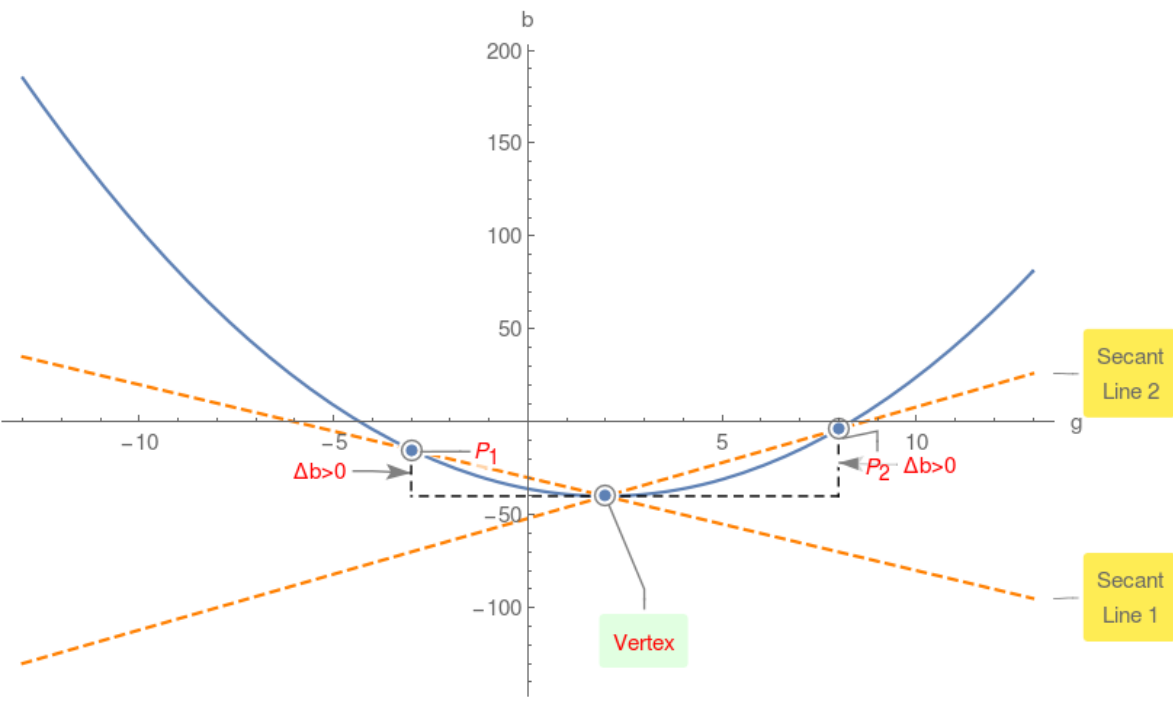
$b(g_1 + h) = -\frac{b^2}{4\,a} + a\,h^2 + c$

Compute $\triangle = b(g_1 + h) - b(g_1) = a\,h^2$

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

Example 1.

$b(g) = g^2 - 4\,g - 36$



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

Example 2.

$b(g) = -3\,g^2 + 18\,g - 55$