Vertex of the Quadratic

Given a quadratic $t(b) = a\,b^2 + b^2 + c$ compute its value at $b_1 = -\frac{b}{2\,a}$ namely $t(b_1) = c - \frac{b^2}{4\,a}$

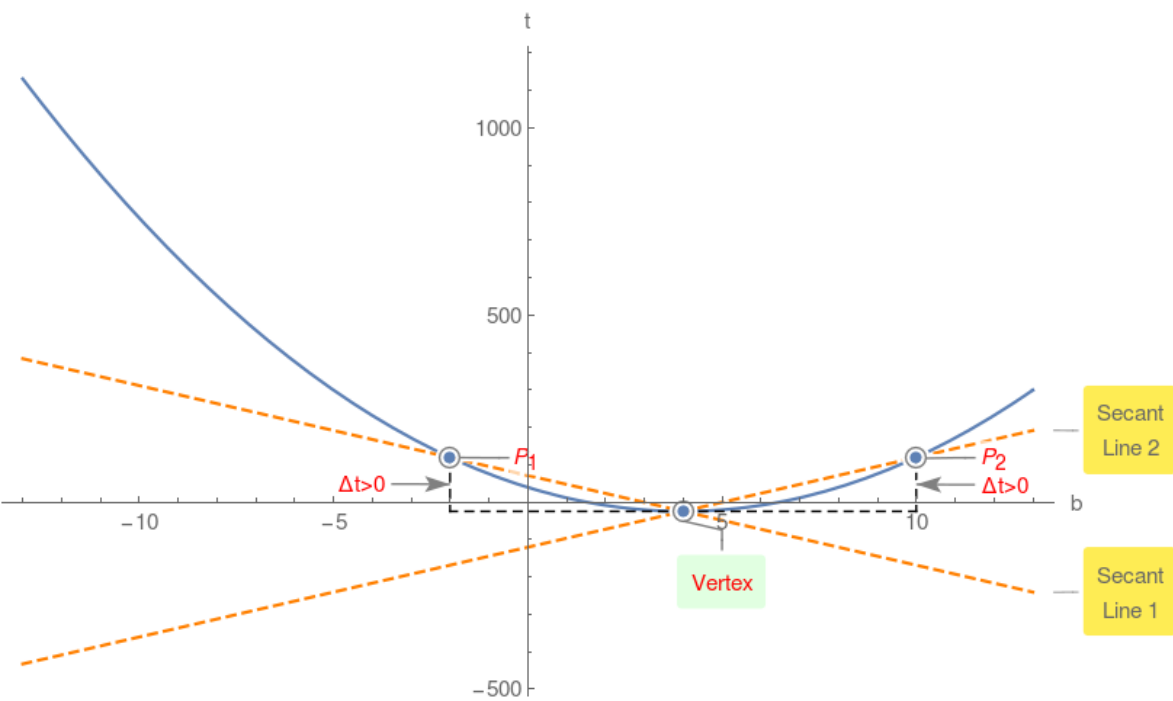
Now compute the same quadratic at $b_1 + h$, namely $t(b_1 + h) = -\frac{b^2}{4\,a} + a\,h^2 + c$

Compute $\triangle = t(b_1 + h) - t(b_1) = a\,h^2$

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

Example 1.

$t(b) = 4\,b^2 - 32\,b + 39$



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

Example 2.

$t(b) = -b^2 + 2\,b + 70$