Vertex of the Quadratic

Given a quadratic $x(j) = a\,j^2 + b\,j + c$ compute its value at $j_1 = -\frac{b}{2a}$ namely $x(j_1) = c - \frac{b^2}{4a}$

Now compute the same quadratic at $j_1 + h$, namely

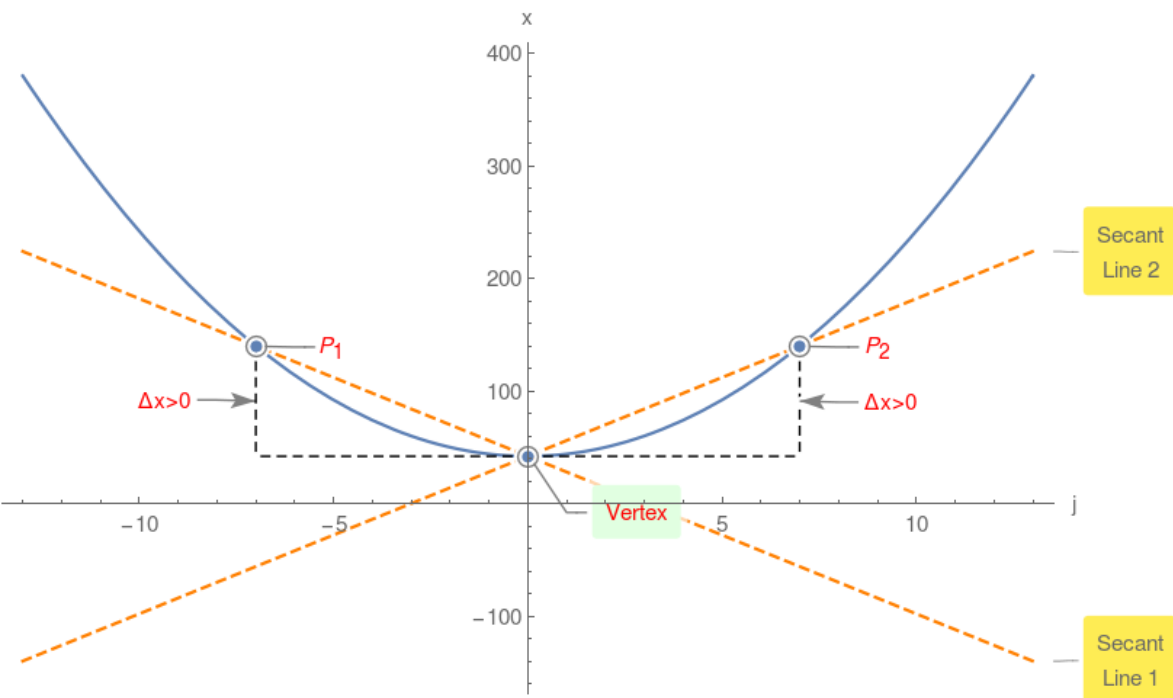
$x(j_1 + h) = -\frac{b^2}{4a} + a\,h^2 + c$

Compute $\triangle = x(j_1 + h) - x(j_1) = a\,h^2$

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

Example 1.

$x(j) = 2\,j^2 + 42$



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

Example 2.

$x(j) = -j^2 - 2\,j - 31$