Vertex of the Quadratic

Given a quadratic $j(z) = a z^2 + b z + c$ compute its value at

$z_1 = -\frac{b}{2a}$ namely $j(z_1) = c - \frac{b^2}{4a}$
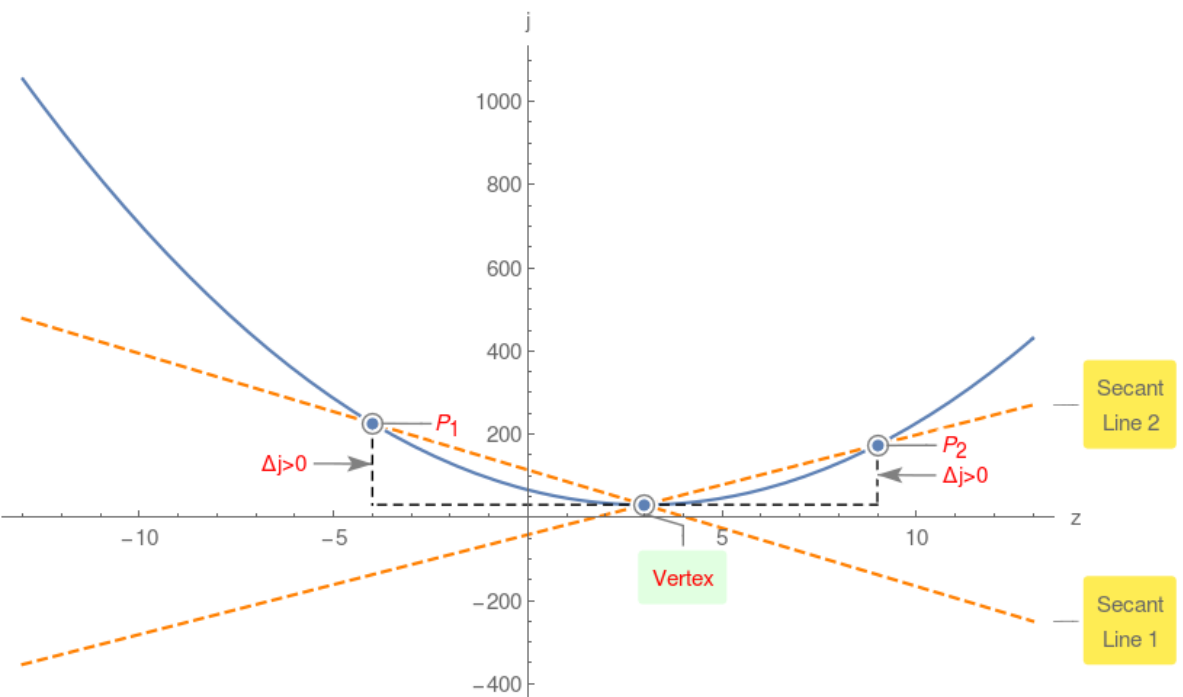
Now compute the same quadratic at $z_1 + h$, namely

$j(z_1 + h) = -\frac{b^2}{4a} + a h^2 + c$

Compute $\triangle = j(z_1 + h) - j(z_1) = a h^2$

Since $h^2 > 0$, therefore if $\boxed{a > 0}$ then $\triangle > 0$ or vertex is the

global minimum!

Example 1.

$j(z) = 4 z^2 - 24 z + 66$

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

Example 2.

$j(z) = -2 z^2 + 8 z - 48$