Vertex of the Quadratic

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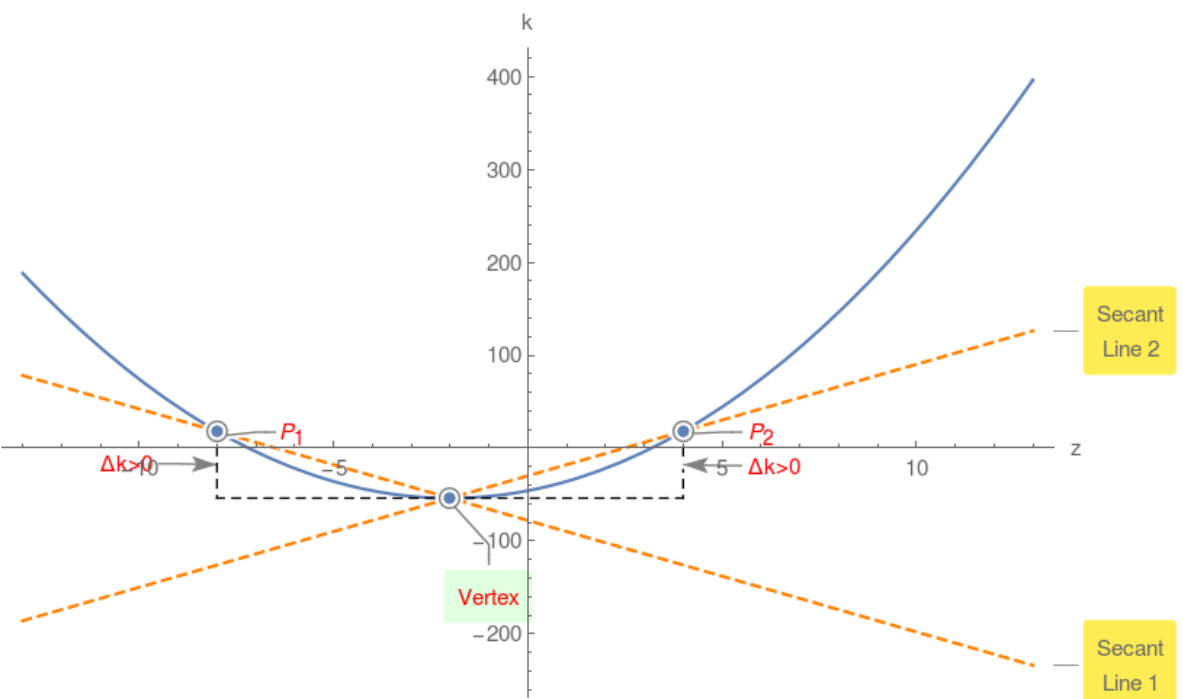Now compute the same quadratic at $z_1 + h$, namely
$k(z_1 + h) = -\frac{b^2}{4a} + a h^2 + c$

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

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

Example 1.
$k(z) = 2 z^2 + 8 z - 46$

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

Example 2.
$k(z) = -2 z^2 - 16 z + 53$