# Vertex of the Quadratic

Given a quadratic $y(v) = a v^2 + b v + c$ compute its value at $v_1 = -\frac{b}{2a}$ namely $y(v_1) = c - \frac{b^2}{4a}$

Now compute the same quadratic at $v_1 + h$, namely

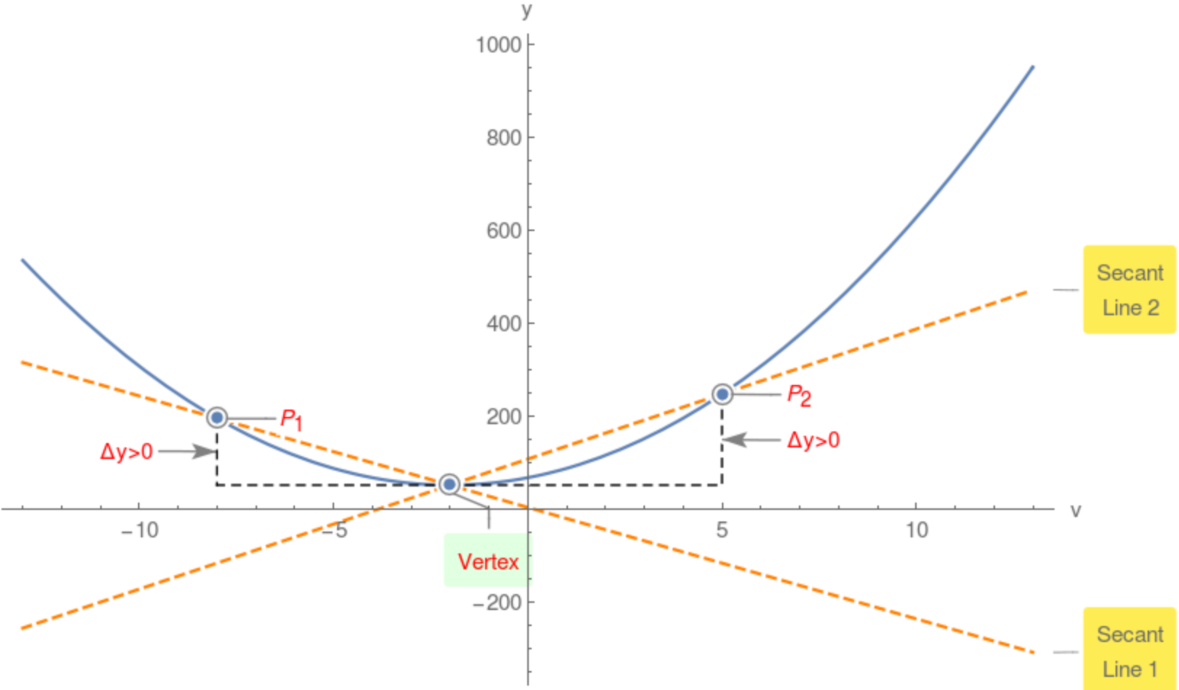
$y(v_1 + h) = -\frac{b^2}{4a} + a h^2 + c$

Compute $\Delta = y(v_1 + h) - y(v_1) = a\, h^2$

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

## Example 1.

$y(v) = 4 v^2 + 16 v + 68$




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

## Example 2.

$y(v) = -2 v^2 - 12 v - 31$