Vertex of the Quadratic

Given a quadratic $s(r) = a\, r^2 + b\, r + c$ compute its value at
$r_1 = -\frac{b}{2a}$ namely $s(r_1) = c - \frac{b^2}{4a}$
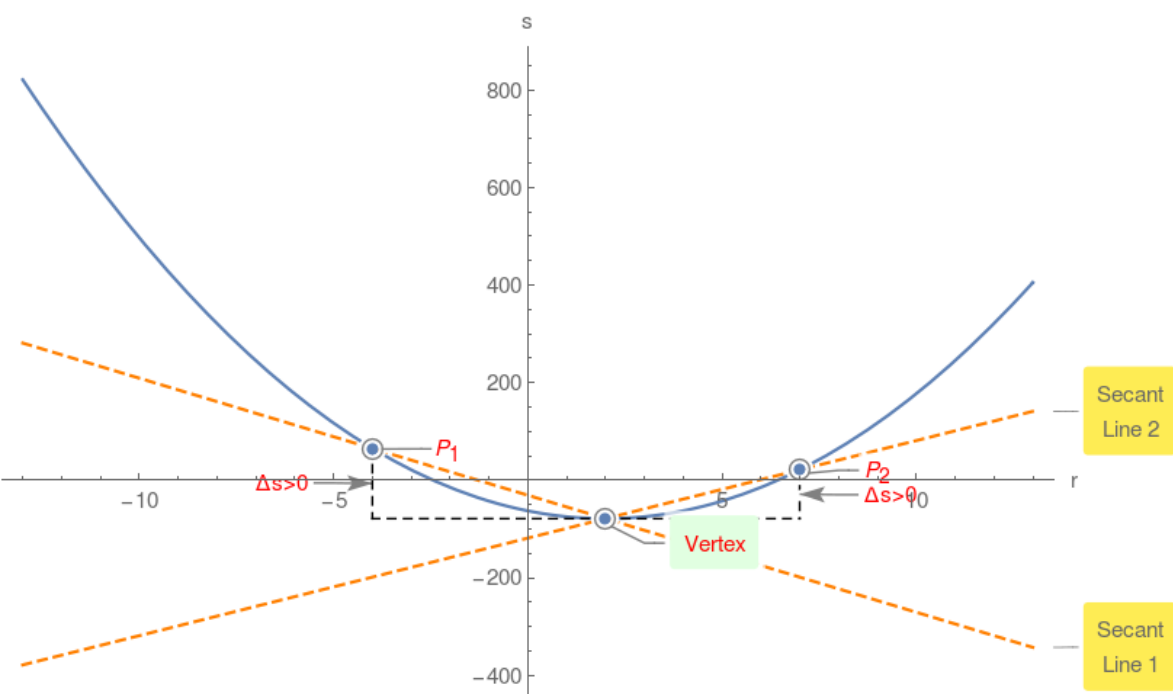Now compute the same quadratic at $r_1 + h$, namely

$s(r_1 + h) = -\frac{b^2}{4a} + a\, h^2 + c$

Compute $\triangle = s(r_1 + h) - s(r_1) = a\, h^2$

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

Example 1.
$s(r) = 4\, r^2 - 16\, r - 63$

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

Example 2.
$s(r) = 57 - 2\, r^2$