Vertex of the Quadratic

Given a quadratic $g(s)=a\,s^2+b\,s+c$ compute its value at $s_1=-\frac{b}{2\,a}$ namely $g(s_1)=c-\frac{b^2}{4\,a}$

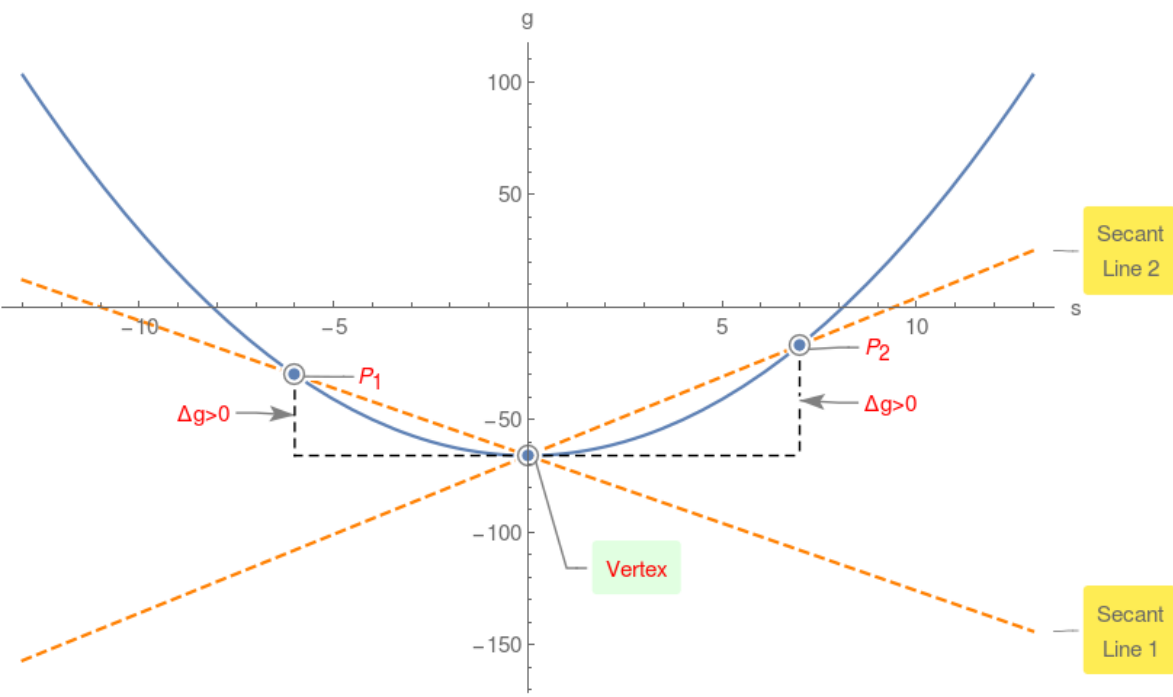
Now compute the same quadratic at s_1+h, namely $g(s_1+h)=-\frac{b^2}{4\,a}+a\,h^2+c$

Compute $\triangle=g(s_1+h)-g(s_1)=a\,h^2$

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

Example 1.

$g(s)=s^2-66$



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

Example 2.

$g(s)=-2\,s^2+8\,s+64$