Vertex of the Quadratic

Given a quadratic $s(f)=a f^2+b f+c$ compute its value at $f_1=-\frac{b}{2a}$ namely $s(f_1)=c-\frac{b^2}{4a}$

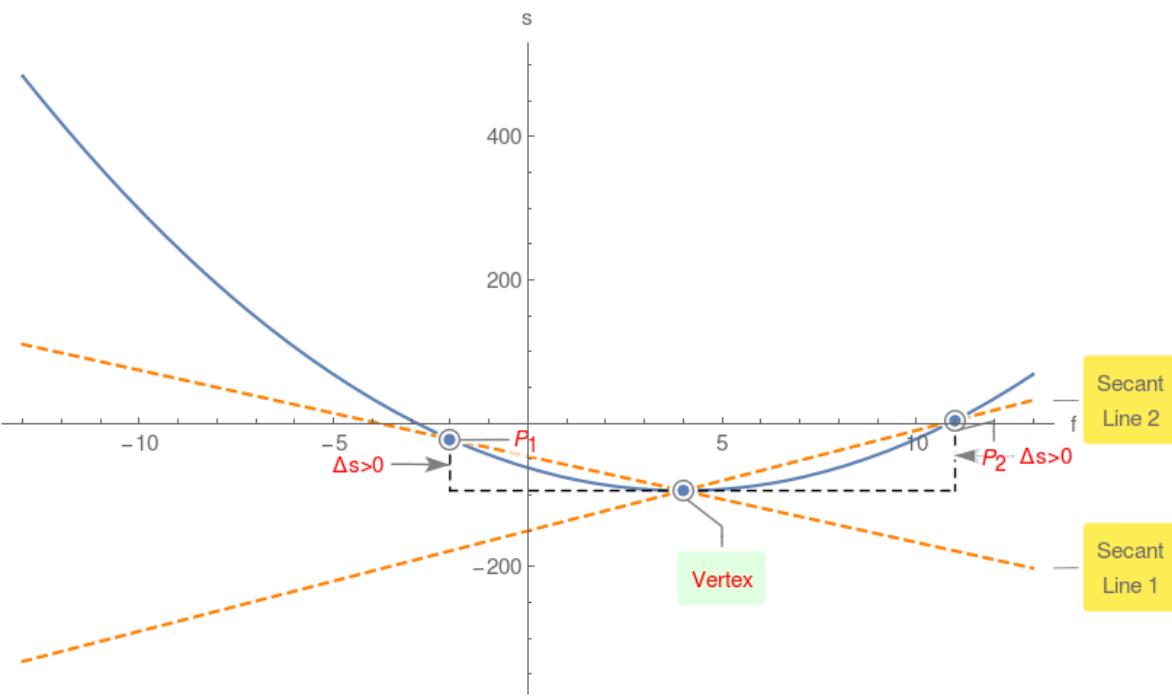
Now compute the same quadratic at f_1+h, namely $s(f_1+h)=-\frac{b^2}{4a}+a h^2+c$

Compute $\triangle=s(f_1+h)-s(f_1)=a h^2$

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

Example 1.

$s(f)=2 f^2-16 f-62$



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

Example 2.

$s(f)=-2 f^2-4 f+41$