Vertex of the Quadratic

Given a quadratic $y(p)=a\,p^2+b\,p+c$ compute its value at $p_1=-\frac{b}{2\,a}$ namely $y(p_1)=c-\frac{b^2}{4\,a}$

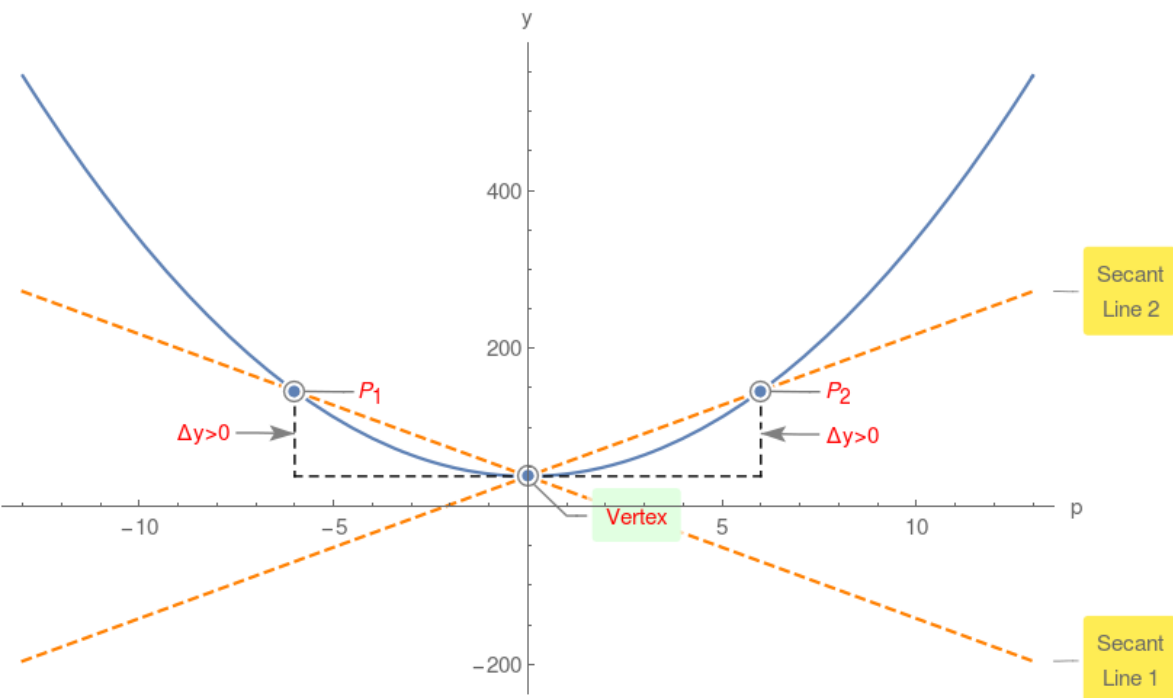
Now compute the same quadratic at p_1+h, namely $y(p_1+h)=-\frac{b^2}{4\,a}+a\,h^2+c$

Compute $\triangle=y(p_1+h)-y(p_1)=a\,h^2$

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

Example 1.

$y(p)=3\,p^2+38$



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

Example 2.

$y(p)=-2\,p^2+12\,p-44$