Vertex of the Quadratic

Given a quadratic $y(d)=a\,d^2+b\,d+c$ compute its value at $d_1=-\frac{b}{2\,a}$ namely $y(d_1)=c-\frac{b^2}{4\,a}$

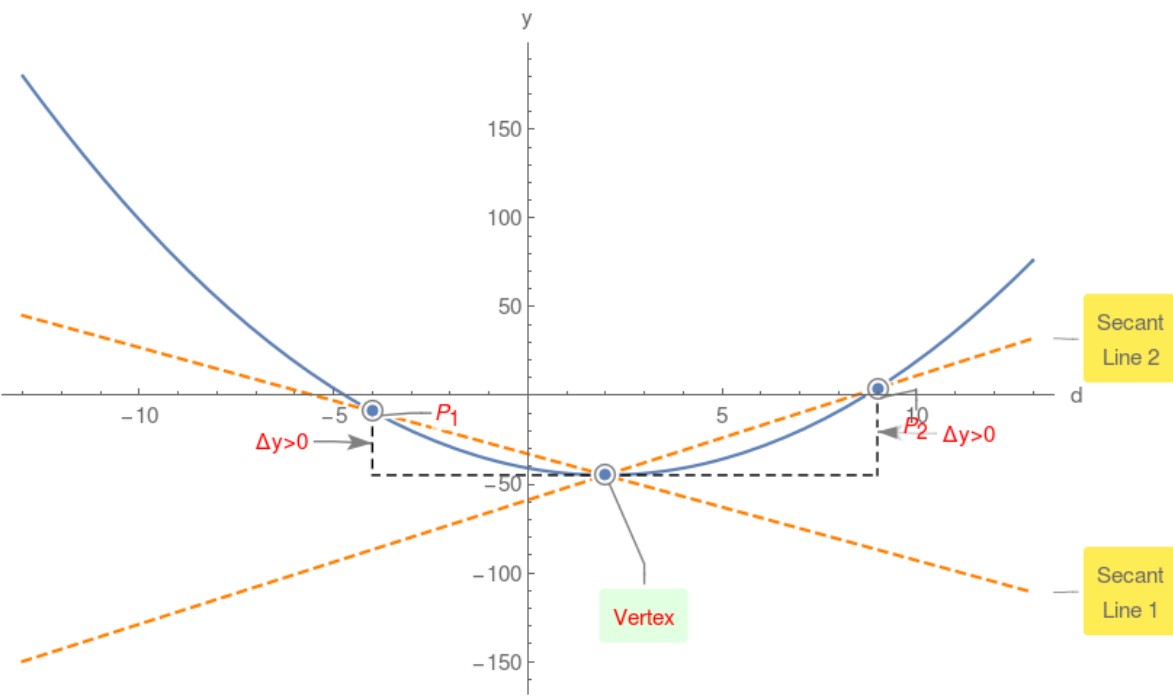
Now compute the same quadratic at d_1+h, namely $y(d_1+h)=-\frac{b^2}{4\,a}+a\,h^2+c$

Compute $\triangle=y(d_1+h)-y(d_1)=a\,h^2$

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

Example 1.

$y(d)=d^2-4\,d-41$



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

Example 2.

$y(d)=-3\,d^2+18\,d-49$