Vertex of the Quadratic

Given a quadratic $b(j)=a\,j^2+b\,j+c$ compute its value at $j_1=-\frac{b}{2\,a}$ namely $b(j_1)=c-\frac{b^2}{4\,a}$

Now compute the same quadratic at j_1+h, namely

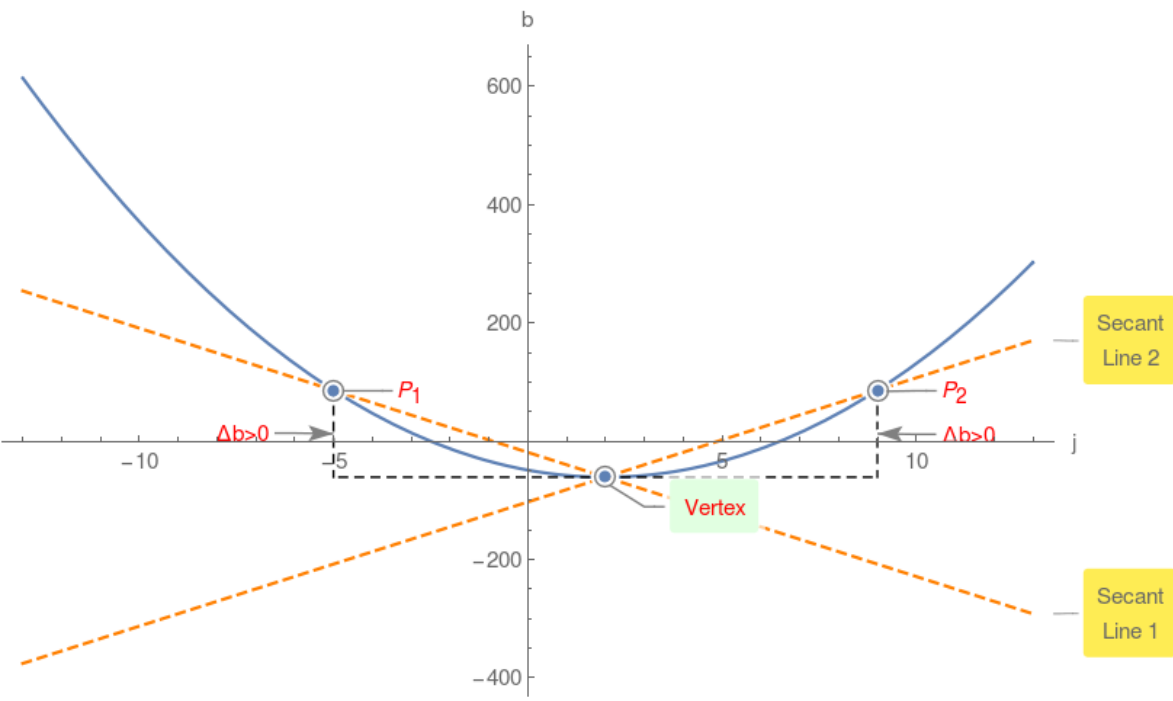
$b(j_1+h)=-\frac{b^2}{4\,a}+a\,h^2+c$

Compute $\triangle=b(j_1+h)-b(j_1)=a\,h^2$

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

Example 1.

$b(j)=3\,j^2-12\,j-49$



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

Example 2.

$b(j)=-2\,j^2+4\,j+62$