

## Vertex of the Quadratic

Given a quadratic  $w(q) = a q^2 + b q + c$  compute its value at

$$q_1 = -\frac{b}{2a} \text{ namely } w(q_1) = c - \frac{b^2}{4a}$$

Now compute the same quadratic at  $q_1+h$ , namely

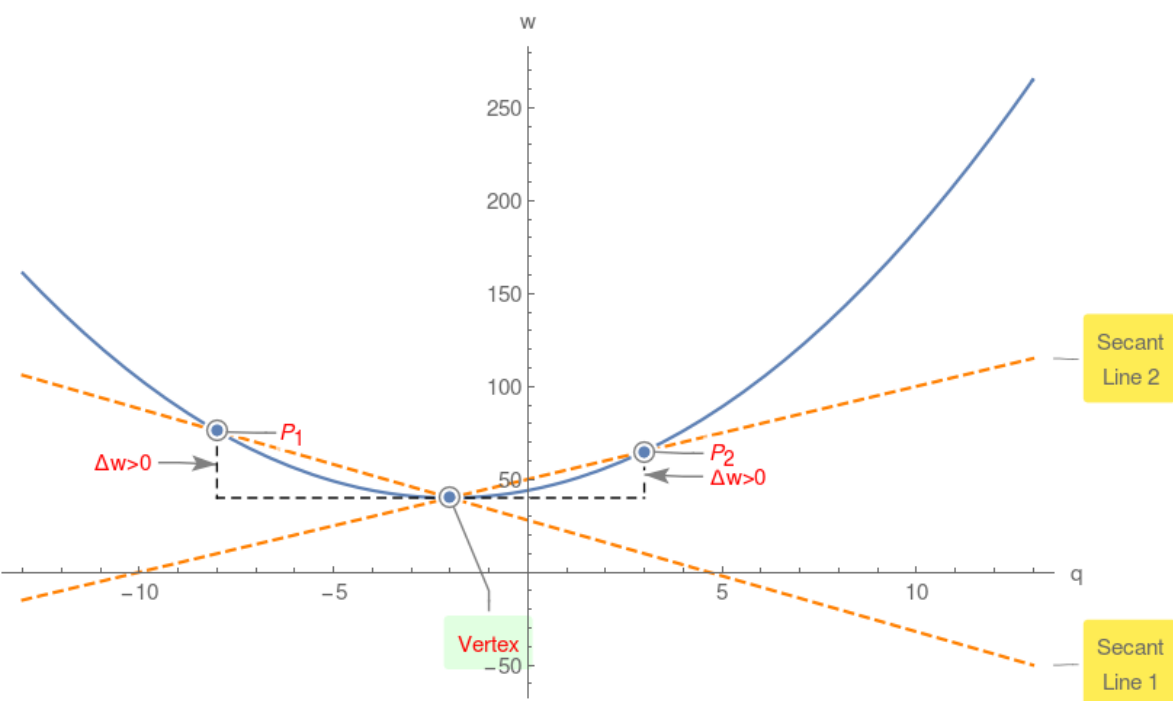
$$w(q_1+h) = -\frac{b^2}{4a} + a h^2 + c$$

$$\text{Compute } \Delta = w(q_1+h) - w(q_1) = a h^2$$

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

### Example 1.

$$w(q) = q^2 + 4q + 44$$



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

### Example 2.

$$w(q) = -q^2 - 6q + 67$$

