

## Vertex of the Quadratic

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

$$t_1 = -\frac{b}{2a} \text{ namely } q(t_1) = c - \frac{b^2}{4a}$$

Now compute the same quadratic at  $t_1+h$ , namely

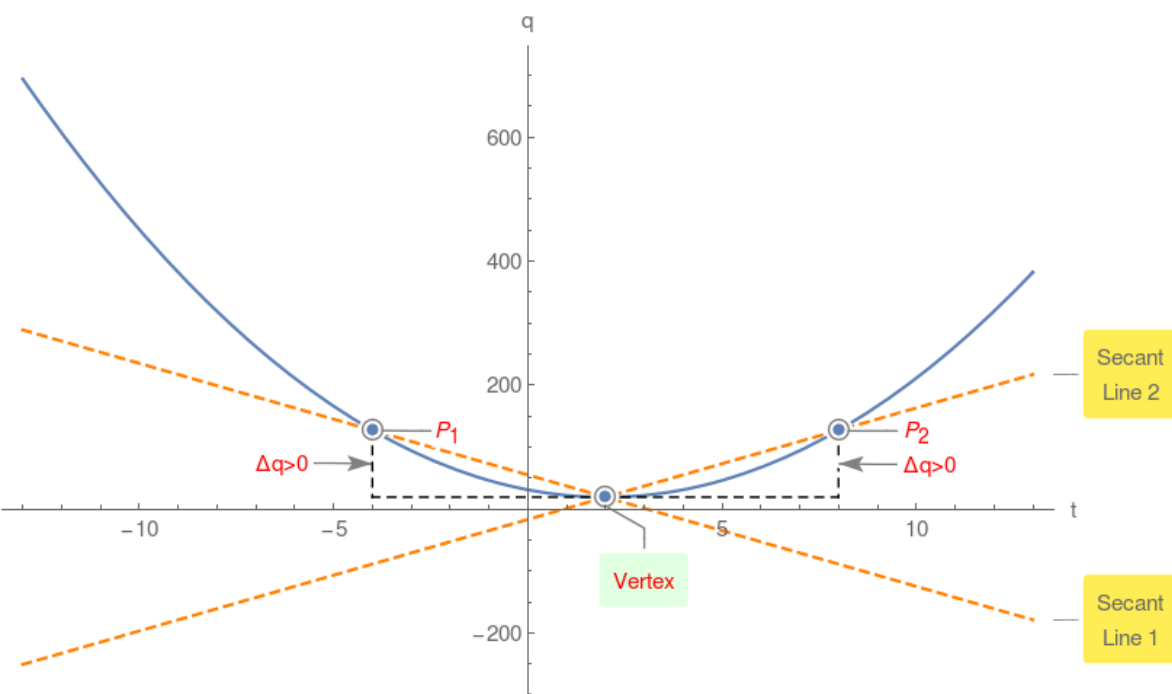
$$q(t_1+h) = -\frac{b^2}{4a} + ah^2 + c$$

$$\text{Compute } \Delta = q(t_1+h) - q(t_1) = ah^2$$

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

### Example 1.

$$q(t) = 3t^2 - 12t + 31$$



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

### Example 2.

$$q(t) = -3t^2 + 18t + 39$$

