

## Vertex of the Quadratic

Given a quadratic  $r(u) = au^2 + bu + c$  compute its value at

$$u_1 = -\frac{b}{2a} \text{ namely } r(u_1) = c - \frac{b^2}{4a}$$

Now compute the same quadratic at  $u_1+h$ , namely

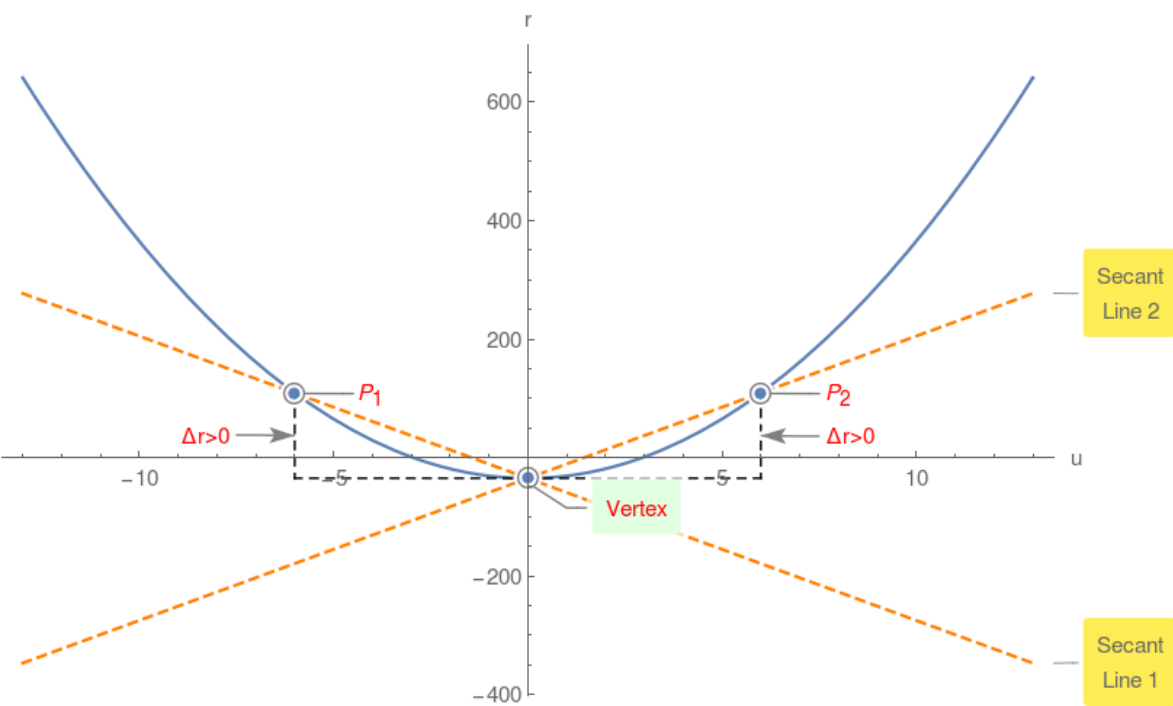
$$r(u_1+h) = -\frac{b^2}{4a} + ah^2 + c$$

$$\text{Compute } \Delta = r(u_1+h) - r(u_1) = ah^2$$

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

### Example 1.

$$r(u) = 4u^2 - 35$$



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

### Example 2.

$$r(u) = -3u^2 + 18u - 39$$

