



$$V_{y0} = V_0 \sin(\theta)$$

$$V_y(t) = V_{y0} - gt$$

$$V_y(t) = 0 = V_{y0} - gt, \quad t = \frac{V_{y0}}{g}$$

$$y = V_{y0}t - \frac{1}{2}gt^2$$

$$y\left(\frac{V_{y0}}{g}\right) = \frac{V_{y0}^2}{g} - \frac{1}{2} \frac{V_{y0}^2}{g} = \frac{V_{y0}^2}{2g} = h_{max}$$

$$10,000 = V_{y0}t - \frac{1}{2}gt^2$$

$$t = \frac{-V_{y0} \pm \sqrt{V_{y0}^2 - 20,000g}}{-g}$$

we want the larger of the two roots (coming down)

$$t = \frac{-V_{y0} - \sqrt{V_{y0}^2 - 20,000g}}{-g}$$