

Physics 131  
Quiz 2  
Frank C. De Lucia

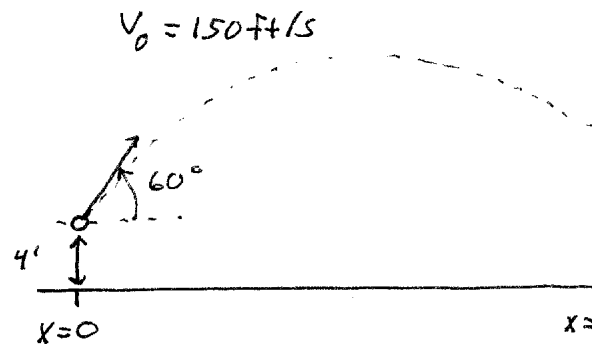
Thursday October 8

2:30

A batter hits a pitched ball whose center is 4.0 ft above the ground so that its angle above the horizontal is  $60^\circ$  and that its initial speed is 150 ft/s. How high must a wall 450 ft from the point of impact be so that the ball just hits the top of the wall?

(1) Horizontal Component of initial velocity:

$$\begin{aligned} V_{0x} &= V_0 \cos \theta \\ &= 150 \text{ ft/s} (\cos 60^\circ) \\ &= 150 \text{ ft/s} (0.5) \\ &= 75 \text{ ft/s} \end{aligned}$$



(2) time to reach wall:

(calculate using x-motion)

$$x - x_0 = v_{0x} t$$

$$t = \frac{x - x_0}{v_{0x}} = \frac{450 \text{ ft}}{75 \text{ ft/s}} = 6 \text{ sec}$$

(3) vertical equation of motion

$$y - y_0 = v_{0y} t - \frac{1}{2} g t^2$$

at  $t = 6 \text{ s}$

$$y - y_0 = (150 \text{ ft/s}) (\underbrace{\sin 60^\circ}_{0.87}) (6 \text{ s}) - \frac{1}{2} (32 \text{ ft/s}^2) (6 \text{ s})^2$$

$$y_{\text{wall}} - 4 \text{ ft} = 783 \text{ ft} - 576 \text{ ft}$$

( $y_0 = 4 \text{ ft}$ )

$$y_{\text{wall}} = 211 \text{ ft}$$