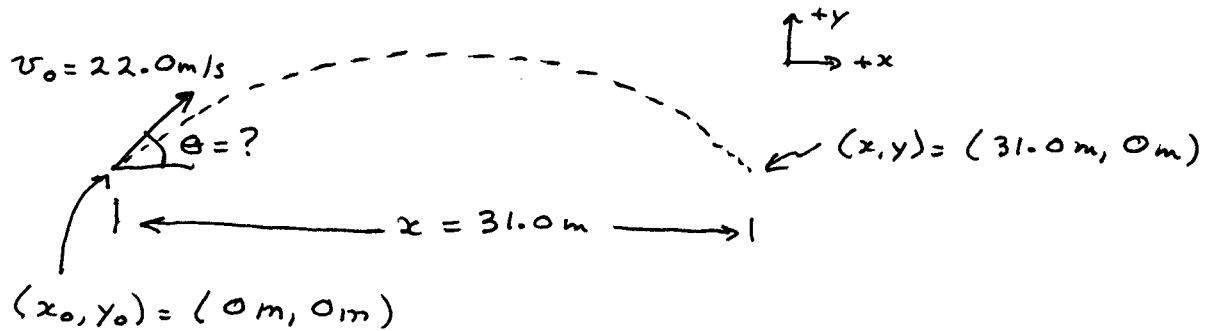


Exercise 7-15



$$v_{0x} = 22.0 \cos \theta$$

$$v_{0y} = 22.0 \sin \theta$$

In y -direction: $y = y_0 + v_{0y}t + \frac{1}{2}a_y t^2$

$$\therefore 0 = 0 + (22.0 \sin \theta)t - 4.90 t^2$$

$$\therefore 22.0 \sin \theta = 4.9 t \quad [1]$$

In x -direction: $x = x_0 + v_{0x}t$

$$\therefore 31.0 = 0 + (22.0 \cos \theta)t$$

$$\therefore t = \frac{31.0}{22.0 \cos \theta} \quad \text{Subst. in [1]}$$

$$\therefore 22.0 \sin \theta = \frac{4.9(31.0)}{22.0 \cos \theta}$$

$$\therefore \sin \theta \cos \theta = \frac{4.9(31.0)}{(22.0)^2} = 0.3138$$

But $\sin \theta \cos \theta = \frac{1}{2} \sin 2\theta$

$$\left(\sin 2\theta = \sin(\theta + \theta) = \sin \theta \cos \theta + \cos \theta \sin \theta = 2 \sin \theta \cos \theta \right)$$

$$\therefore \sin 2\theta = 2(0.3138) = 0.6276$$

$$\therefore 2\theta = \sin^{-1}(0.6276) = 38.87^\circ$$

$$\therefore \theta = 19.4^\circ$$