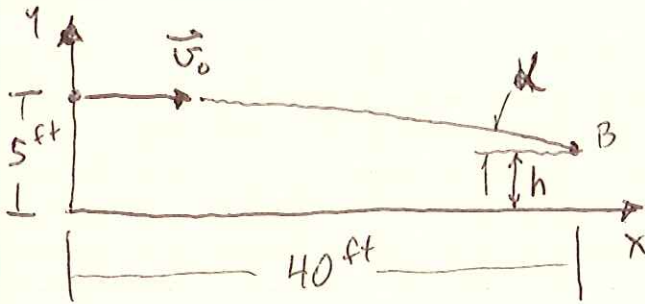


PROB. 11-100



PLANAR MOTION

$$\theta_0 = 0$$

$$\vec{a} = (-32.2) \hat{j} \frac{\text{ft}}{\text{s}^2}$$

$31 \leq h \leq 42^{\text{ft}}$, FIND RANGE OF $(v_x)_0$

FIND α FOR $h = 31$ AND 42^{ft}

$$2.583 \leq h \leq 3.5^{\text{ft}}$$

$$\vec{v}_0 = (0) \hat{i} + (5) \hat{j} \frac{\text{ft}}{\text{s}}$$

$$\vec{v}_0 = [(v_x)_0] \hat{i} + (0) \hat{j} \frac{\text{ft}}{\text{s}}$$

Y-DIRECTION:

$$y = y_0 + (v_y)_0 t - \frac{1}{2} g t^2 = 5 - \frac{1}{2} (32.2) t^2 = 5 - 16.1 t^2$$

$$t = \sqrt{\frac{5-y}{16.1}}$$

$$\text{FOR } h = 2.583^{\text{ft}}, t = \sqrt{\frac{5-2.583}{16.1}} = 0.3874^{\text{s}}$$

$$\text{FOR } h = 3.5^{\text{ft}}, t = \sqrt{\frac{5-3.5}{16.1}} = 0.3052^{\text{s}}$$

X-DIRECTION:

$$x = x_0 + (v_x)_0 t = (v_x)_0 t$$

$$(v_x)_0 = \frac{x}{t}$$

$$\text{FOR } h = 2.583^{\text{ft}}, (v_x)_0 = \frac{(40^{\text{ft}})}{(0.3874^{\text{s}})} = 103.2 \frac{\text{ft}}{\text{s}} = 70.36 \frac{\text{mi}}{\text{hr}}$$

PROB. 11-100 CONT.

$$\text{FOR } h = 3.5 \text{ ft}, (v_x)_0 = \frac{(40 \text{ ft})}{(0.3052 \text{ s})} = 131.1 \frac{\text{ft}}{\text{s}} = 89.39 \frac{\text{mi}}{\text{hr}}$$

$$70.36 \leq (v_x)_0 \leq 89.39 \frac{\text{mi}}{\text{hr}}$$

$$\alpha = \text{TAN}^{-1} \left(\frac{dy}{dx} \right) = \text{TAN}^{-1} \left(\frac{dy/dt}{dx/dt} \right) = \text{TAN}^{-1} \left(\frac{v_y}{v_x} \right)$$

$$v_y = -32.2 t, \quad \cancel{v_x} (v_x = (v_x)_0)$$

$$\text{FOR } h = 2.583 \text{ ft}, (v_x)_0 = 103.2 \frac{\text{ft}}{\text{s}}$$

$$\alpha = \text{TAN}^{-1} \left[\frac{-32.2(0.3874)}{(103.2)} \right] = -6.892^\circ$$

$$\text{FOR } h = 3.5 \text{ ft}, (v_x)_0 = 131.1 \frac{\text{ft}}{\text{s}}$$

$$\alpha = \text{TAN}^{-1} \left[\frac{-32.2(0.3052)}{(131.1)} \right] = -4.287^\circ$$

$$-6.892^\circ \leq \alpha \leq -4.287^\circ$$