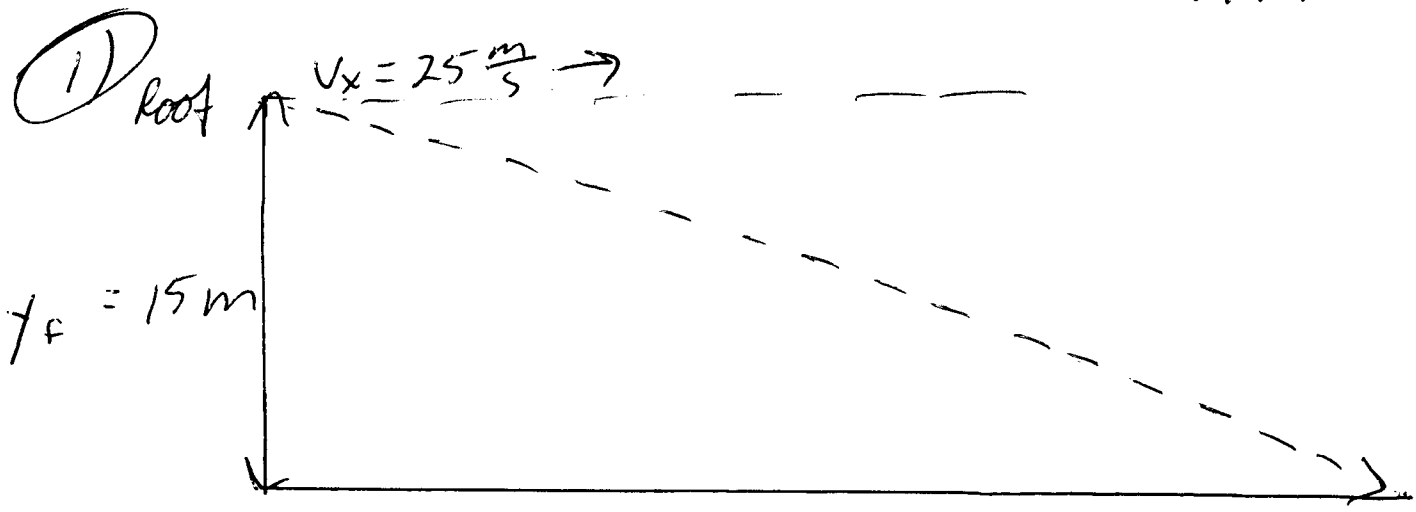
Physics 1P — Traeger

Projectile Motion: Cliff

(1)



What are we solving for?

1) time to hit ground

2) horizontal distance before hitting ground

Equations to Use

$y_f = \cancel{y_0}^{0} + \cancel{v_{0y}}^{0} t + \frac{1}{2} g t^2$ and $x = v_x \cdot t$

1) Solve for time by rearranging equation

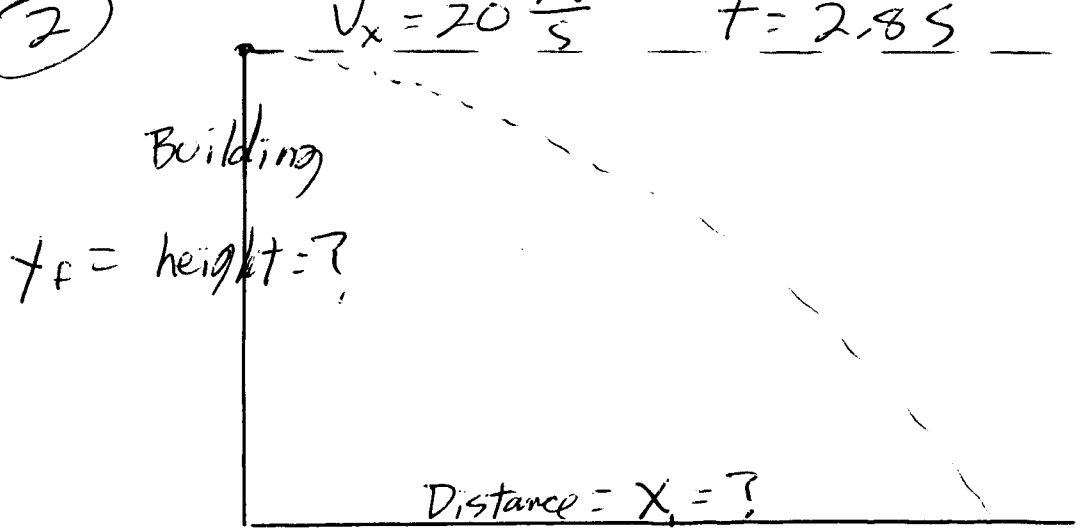
$y_f = \frac{1}{2} g t^2$

$\sqrt{\frac{2 y_f}{g}} = t$ so... $t = \sqrt{\frac{2 \cdot 15\,m}{9.8 \frac{m}{s^2}}} = \boxed{1.8\,s}$

now, plug in to equation $x = v_x \cdot t$

$x = 25 \frac{m}{s} \cdot 1.8\,s = \boxed{45\,m}$

(2)



a) How far? Use $X = \vec{V}_x \cdot t$

$X = 20 \frac{m}{s} \cdot 2.85 \approx 56\ m$

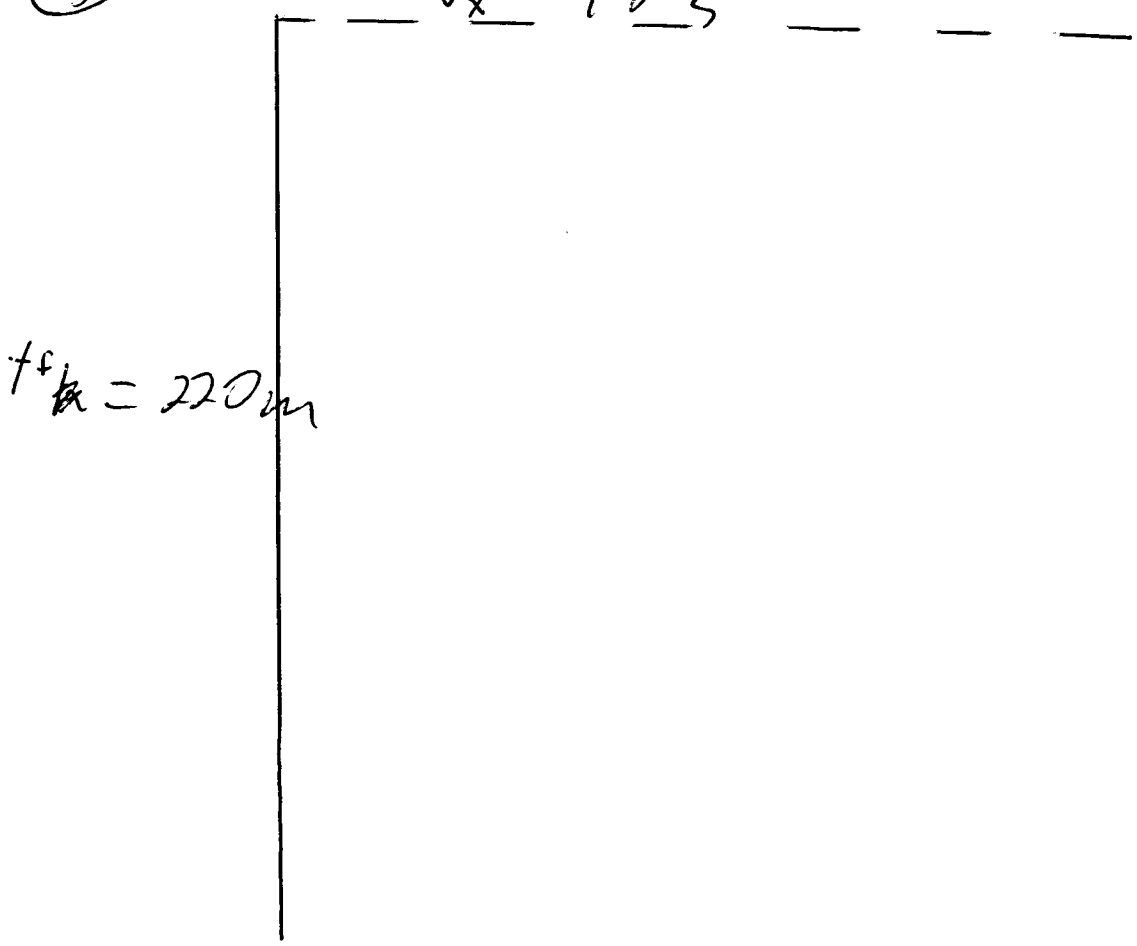
b) Height of Building?

Use $y_f = y_0 + V_{0y} t + 1/2 g t^2$

$y_f = \frac{1}{2} g t^2 = \frac{1}{2} \cdot 9.8 \frac{m}{s^2} \cdot (2.85)^2 =$

38.4 m

(3)



a) How long to reach the ground?

Use

$y_f = y_0 + V_{0y} t + \frac{1}{2} g t^2$

$y_f = \frac{1}{2} g t^2$ Solve for t

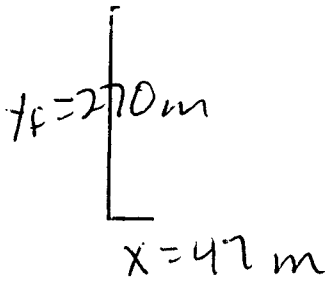
$\sqrt{\frac{2 y_f}{g}} = t = \sqrt{\frac{2 \cdot 220 m}{9.4 \frac{m}{s^2}}} = 6.7 s$

b) How far will it land from building?

Use $X = V_x \cdot t$

$X = 18 \frac{m}{s} \cdot 6.7 s \approx 121 m$

(4)



We first want to know time that it will take Goofy to fall 270 m.

Use $y_f = y_0 + v_{0f}t + \frac{1}{2}gt^2$ to find this.

$$y_f = \frac{1}{2}gt^2$$

$$t = \sqrt{\frac{2y_f}{g}} = \sqrt{\frac{2 \cdot 270\,m}{9.8\,\frac{m}{s^2}}} = 7.4\,s$$

now, use $x = \vec{v}_x \cdot t$ to find $\vec{v}_x$

$$\vec{v}_x = \frac{x}{t} = \frac{47\,m}{7.4\,s} = 6.4\,\frac{m}{s}$$