Prob # 1

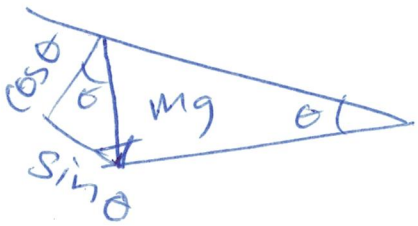
Step #1: Conserve momentum

$$P_{before} = P_{after}$$

$$m v_0 = (m + 2m) v \quad \Rightarrow \quad v = \frac{1}{3} v_0$$

Step #2 Find acceleration on ramp

$$a = g \sin\theta \quad \text{on ramp}$$



Step #3 Find height:

Method #1

acceleration

$$v^2 = v_0^2 + 2a\Delta x$$

$$0 \qquad g\sin\theta$$

$$\Delta x = \frac{v^2}{2a} = \frac{\left(\frac{1}{3}v_0\right)^2}{2g\sin\theta}$$

Method #2

Energy:

$$KE = PE$$

$$\frac{1}{2} m v^2 = mgh = mgx\sin\theta$$

$$x = \frac{v^2}{2g\sin\theta} = \frac{\left(\frac{1}{3}v_0\right)^2}{2g\sin\theta}$$

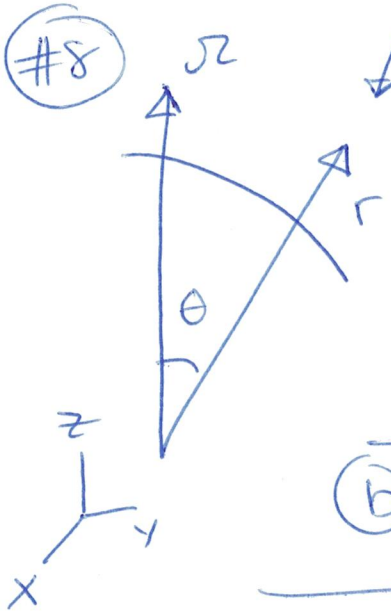
Find time

$$v = v_0 + at$$

$v \to 0$, $a \to g\sin\theta$

$$t = \frac{v}{a} = \frac{\frac{1}{3}v_0}{g\sin\theta}$$

#8



Coriolis $2m\upsilon \times \Omega$ ⊗ East F_{cor}

$F_{cor} = 2m\upsilon\Omega \sin\theta$

Centrifugal $m(\Omega \times r) \times \Omega$ → F_{cf} y direction

$= m\Omega^2 r \sin\theta$

(b) $\upsilon = 100 \frac{m}{s}$ $X = 10^4 m$ $t = 100$ sec

Displacement East due to Coriolis Force

$F_{cor} = 2m\upsilon\Omega \sin\theta$

$F = ma$

$a = \frac{F}{m}$

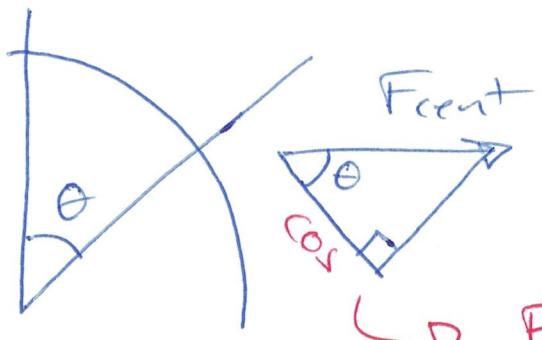
$X = X_0 + \upsilon_0 t + \frac{1}{2}at^2$

$\hookrightarrow 0 \quad \hookrightarrow 0$

$X = \frac{1}{2}(2\upsilon\Omega \sin\theta)\, t^2$

$= 60$ meters

Displacement South due to Centrifugal



$F_{cent}\cos\theta$ deflects to South

$$F_{South} = [m\Omega^2 r \sin\theta]\cos\theta$$

$$a = \frac{F_{South}}{m} = \Omega^2 r \sin\theta\cos\theta$$

$$X = \frac{1}{2} a t^2 = \frac{1}{2}[\Omega^2 r \sin\theta\cos\theta]\, t^2$$

$$= 77 \text{ meters}$$

(C)

$m(\Omega \times r) \times \Omega \Rightarrow$ $F_{cent.}$ →

If $v = \otimes$ $F_{cor} = 2mv \times \Omega =$ F_{cor} →

Forces Align