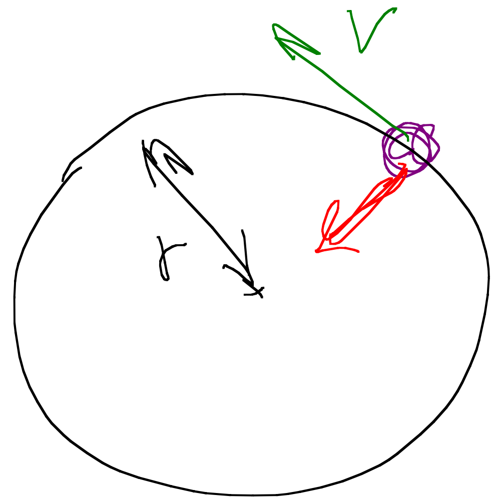
Phys 2110-3 10/4/10

Note Title 10/4/2010

(Uniform) Circular Motion

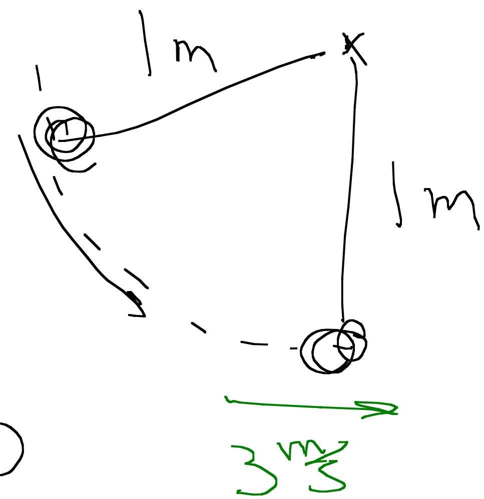


$\vec{F}_{net}$ points toward center

$$F_{(c)} = \frac{mv^2}{r}$$

Ball end of string,

mass = 1.5 kg



What is tension in string at bottom of swing?

$$a = \frac{v^2}{r}$$

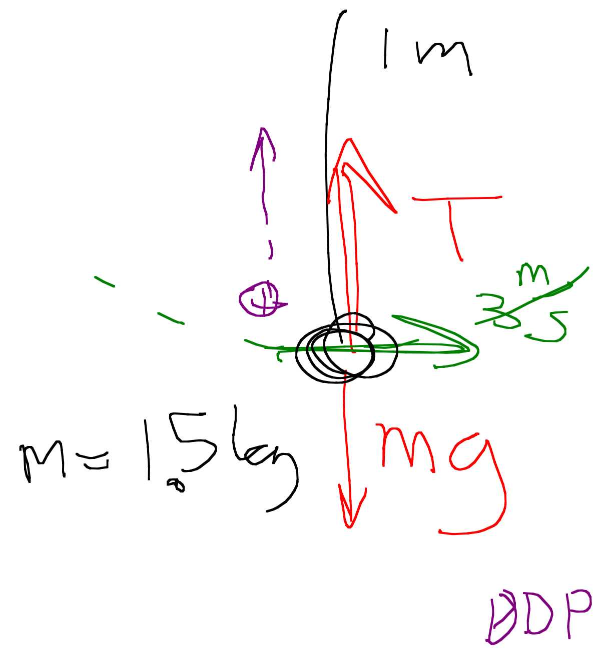
$$F_{net} = \frac{mv^2}{r} \quad \text{(upward)}$$

$$= T - mg \quad \text{(upward)}$$

$$T = mg + \frac{mv^2}{r}$$

$$= m\left(9.80\,\frac{m}{s^2} + \frac{\left(3\,\frac{m}{s}\right)^2}{(1\,m)}\right)$$

$$= 28.2\,N$$



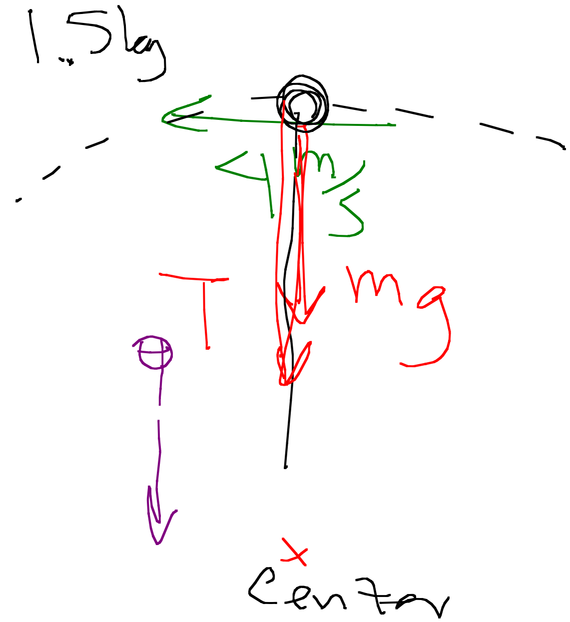
At top of swing

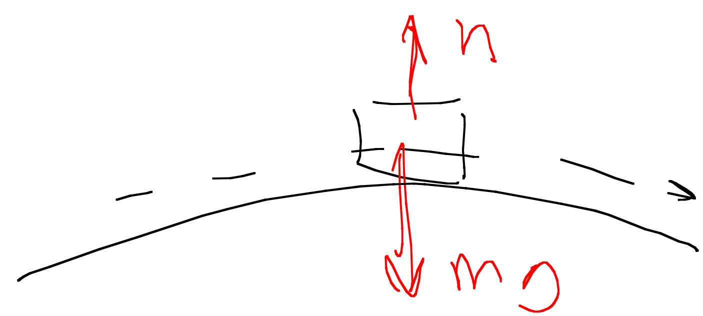
$$F_c = T + mg = \frac{mv^2}{r}$$

$$T = m\left(\frac{v^2}{r} - g\right)$$

$$= (1.5)\left(\frac{(4\frac{m}{s})^2}{1m} - (9.8\frac{m}{s^2})\right)$$

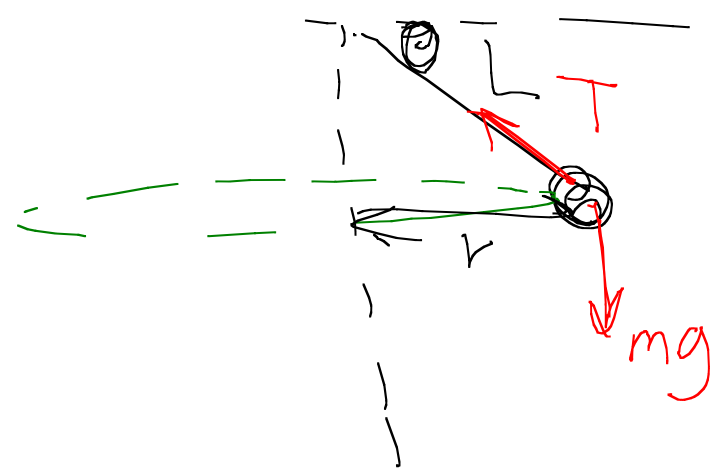
$$= 9.3N$$





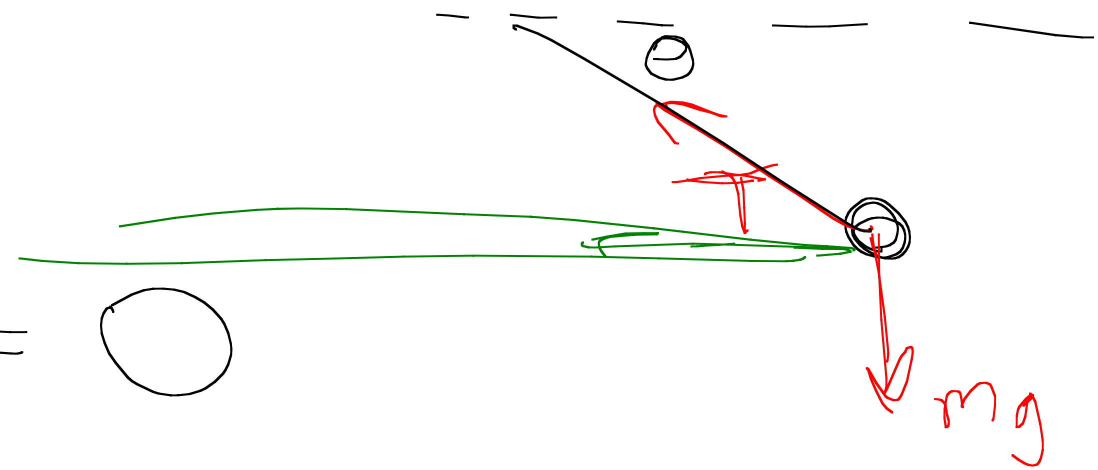
5.24 940-g rock whirled in horiz. circle at end of 1.3 m string. Breaking str. of str. is 120 what is max allowable speed of rock b) At this speed what angle does string make with horizontal?

$r = L\cos\theta$



Vertical forces add to zero

$$T\sin\theta - mg = 0$$



$$T\cos\theta = \frac{mv^2}{r}$$

$m = 0.940\ \mathrm{kg}$

$\boxed{\text{Unknowns } v, \theta}$

$$\frac{mv^2}{r} = T\cos\theta$$

$T = 120\ \mathrm{N}$

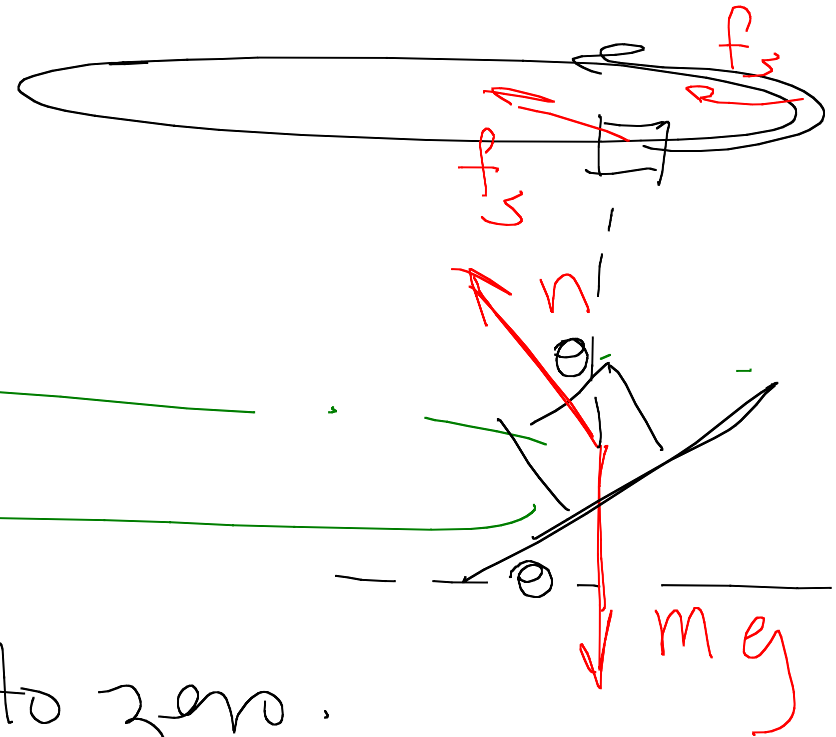
$$mg = T\sin\theta$$

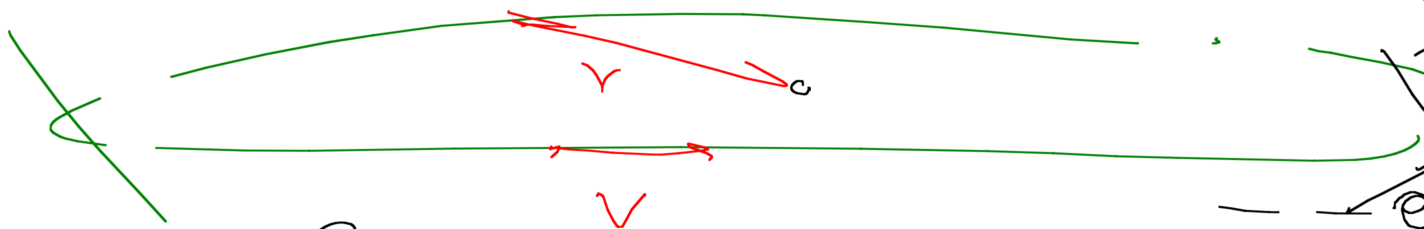
① $r = L\cos\theta$

$$\sin\theta = \frac{mg}{T} \Longrightarrow \boxed{v = 12.8\ \mathrm{m/s}}$$

Banked curve,

no friction





Vertical forces add to zero.

$$n\cos\theta - mg = 0$$

$$F_c = n\sin\theta = \frac{mv^2}{r}$$

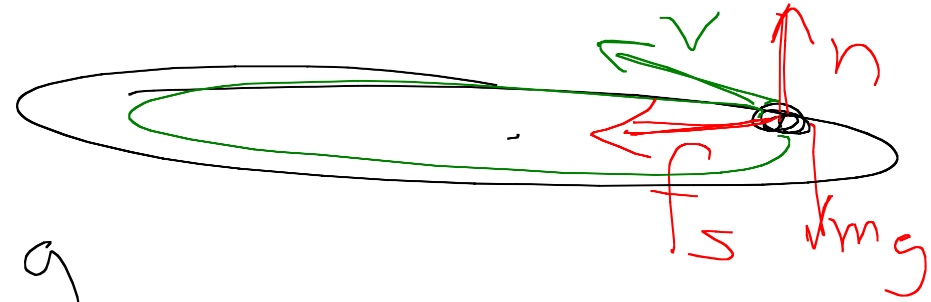
$$F_{air}\cos\theta - mg = 0$$

$$F_{air}\sin\theta = \frac{mv^2}{r}$$

Homework

$$f_s = \mu_s n = \mu_s m g$$

$$= m \frac{v^2}{r} \qquad v = \frac{2\pi r}{T}$$

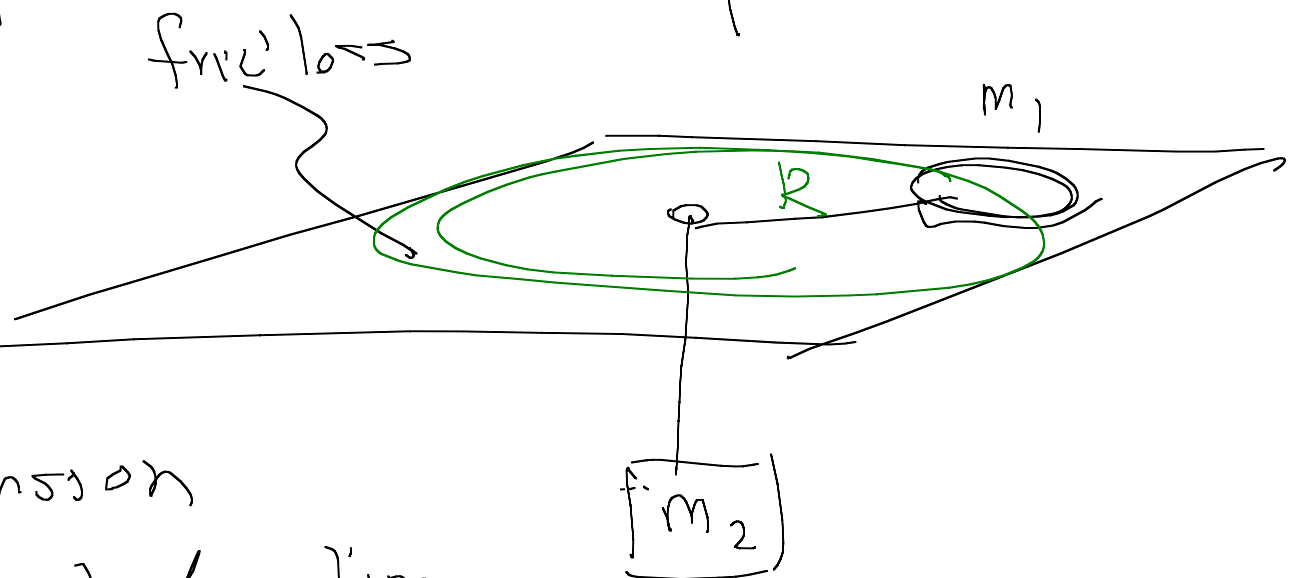


5.37

Static!

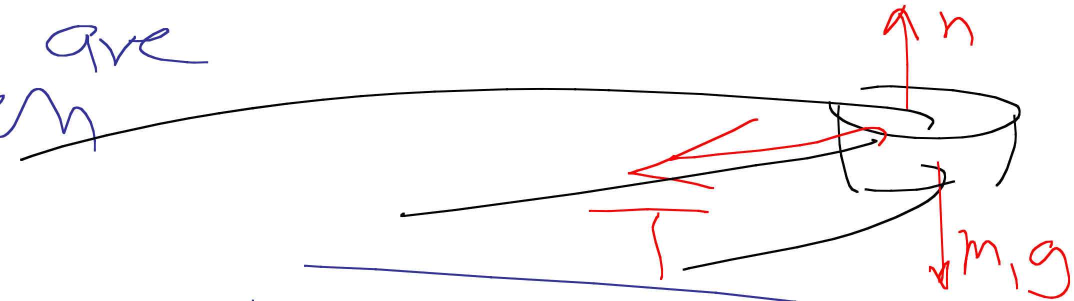
Find a) Tension

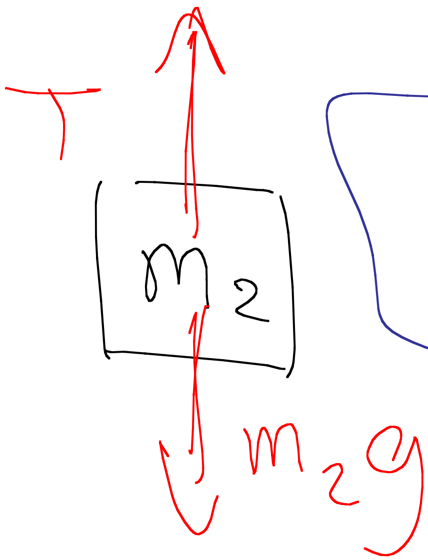
b) Period of motion



masses are given

<u>DDP</u>





$$\boxed{T = m_2 g} \qquad \boxed{T = \frac{m v^2}{R}}$$

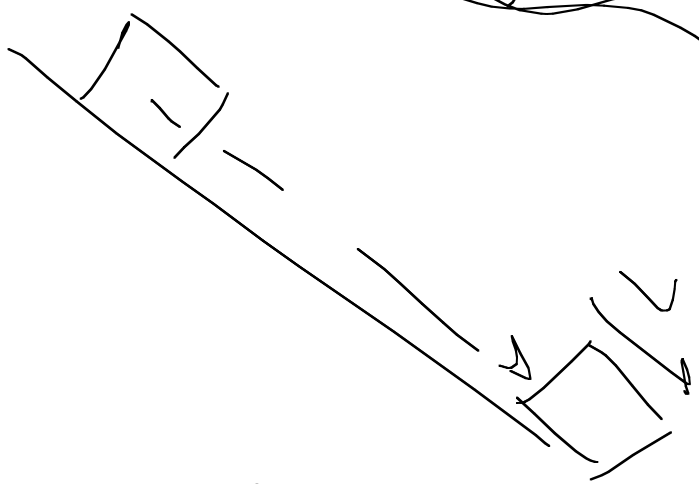
$$\Longrightarrow m_2 g = \frac{m_1 v^2}{R} \qquad v = \frac{2\pi R}{\tau}$$

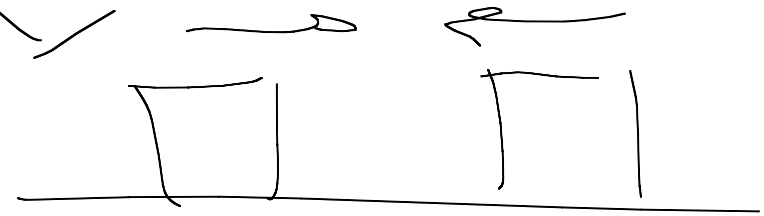
$$\Longrightarrow v = \sqrt{\frac{m_2 g R}{m_1}} = \frac{2\pi R}{\tau}$$

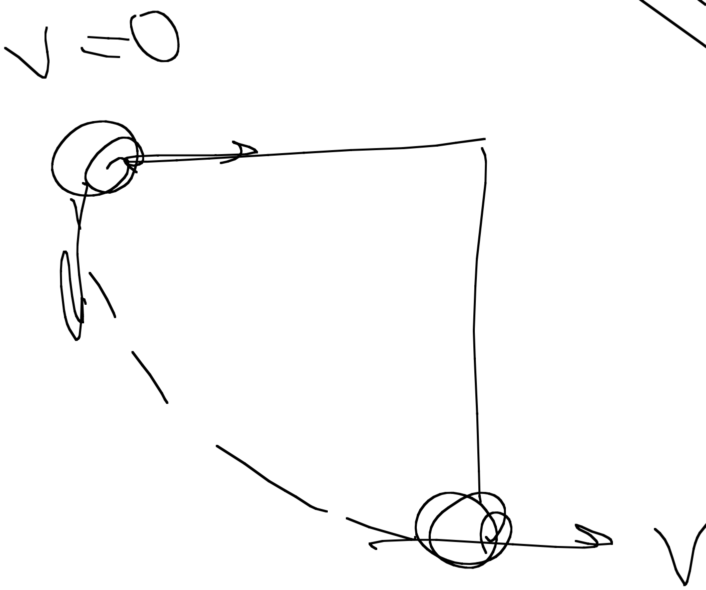
$$\tau = 2\pi \sqrt{\frac{m_1 R}{m_2 g}}$$

Chap 6

N's Laws







Energy

Momentum