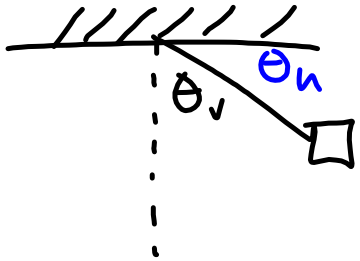
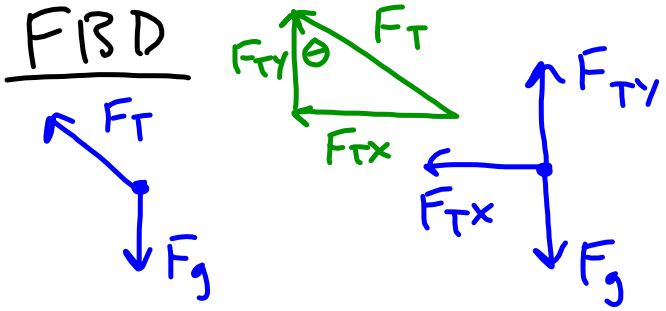
Quiz - Review

A 0.25-kg flying pig travels in a circular path with a period of 3.28 s and radius of 1 m. Find the angle the string of the flying pig makes with the vertical.



FBD



$$\tan\theta = \frac{F_{TX}}{F_{TY}}$$

$$\theta = \tan^{-1}\left(\frac{F_{TX}}{F_{TY}}\right)$$

$$= \tan^{-1}\left(\frac{0.91\,N}{2.45\,N}\right)$$

$$= 20.5^\circ$$

$$F_{TY} = F_g$$

$$= ma_g$$

$$= (0.25\,kg)(9.8\,m/s^2)$$

$$= 2.45\,N$$

$$F_c = F_{TX}$$

$$F_c = ma_c$$

$$F_{TX} = (0.25\,kg)(3.65\,m/s^2)$$

$$= 0.91\,N$$

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

$$= \frac{(1.91\,m/s)^2}{1\,m}$$

$$= 3.65\,m/s^2$$

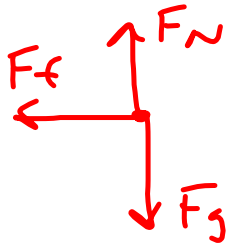
$$v = \frac{2\pi r}{T}$$

$$= \frac{2\pi(1\,m)}{3.28}$$

$$= 1.91\,m/s$$

A 900-kg car is moving through a turn that has a radius of 55 m. If the force of friction is 6000 N, what is the maximum speed the car may move through the turn without sliding?

FBD



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

$v^2 = a_c r$

$v = \sqrt{a_c r}$

$= \sqrt{(6.67\ m/s^2)(55\ m)}$

$= 19.2\ m/s$

$F_c = m a_c$

$a_c = \frac{F_c}{m}$

$= \frac{6000\ N}{900\ kg}$

$= 6.67\ m/s^2$

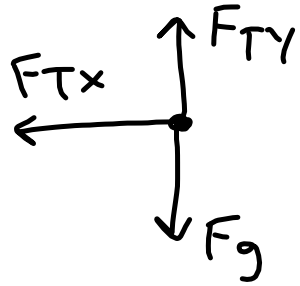
m_1	m_2	r	F_g	g
$2m_1$	$3m_2$	$\frac{1}{5}r$	$\frac{G(2m_1)(3m_2)}{(\frac{1}{25})r^2} = 150F$	$\frac{G(3m_2)}{(\frac{1}{25})r^2} = 75g$
$5m_1$	m_2	$3r$	$\frac{G(5m_1)(m_2)}{9r^2} = \frac{5}{9}F$	$\frac{G(m_2)}{9r^2} = \frac{1}{9}g$
m_1	$6m_2$	$\frac{1}{3}r$	$\frac{G(m_1)(6m_2)}{(\frac{1}{9})r^2} = 54F$	$\frac{G(6m_2)}{(\frac{1}{9})r^2} = 54g$

$$\frac{150\,G m_1 m_2}{r^2} = 150\,F$$

$$F = \frac{G m_1 m_2}{r^2}$$

$$\frac{G(2m_1)(3m_2)}{\left(\frac{1}{5}r\right)^2}$$

FBD for flying object



FBD for car