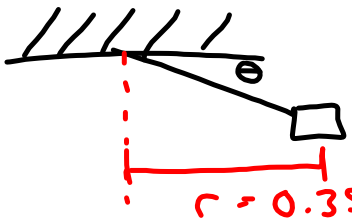
Circular Motion PS

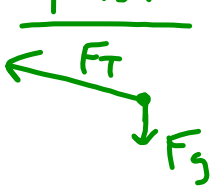
2)

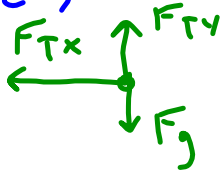


$m = 0.63\ kg$

$f = 3\ \frac{rev}{s}$

FBD (F_c!)





$$T = \frac{1}{f} = \frac{1}{3\frac{rev}{s}} = 0.33\ s$$

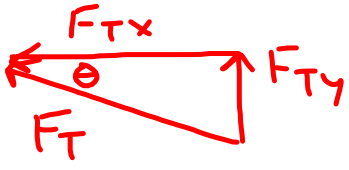
$$v = \frac{2\pi r}{T}$$
$$= 6.67\ m/s$$

$$a_c = \frac{v^2}{r}$$
$$= 127\ m/s^2$$

$$F_c = ma_c$$

$$F_{Tx} = ma_c$$
$$= 80.1\ N$$

b)



$$\tan\theta = \frac{F_{Ty}}{F_{Tx}}$$

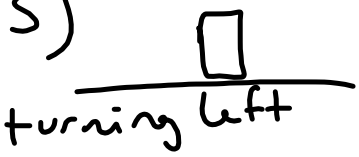
$$\theta = \tan^{-1}\left(\frac{F_{Ty}}{F_{Tx}}\right)$$

$$= \tan^{-1}\left(\frac{6.17\ N}{80.1\ N}\right)$$

$$= 4.4°$$

$F_{Ty} = F_g$
$= 6.17\ N$

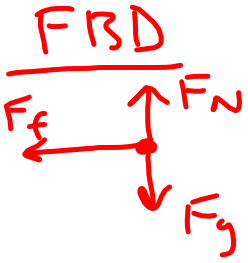
3)



$v = 19\ m/s$

$m = 1240\ kg$

FBD



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

$$= 10.31\ m/s^2$$

$F_f = F_c$

$F_c = ma_c$

$F_f = ma_c$

$= 12784\ N$

$$\mu = \frac{F_f}{F_N}$$

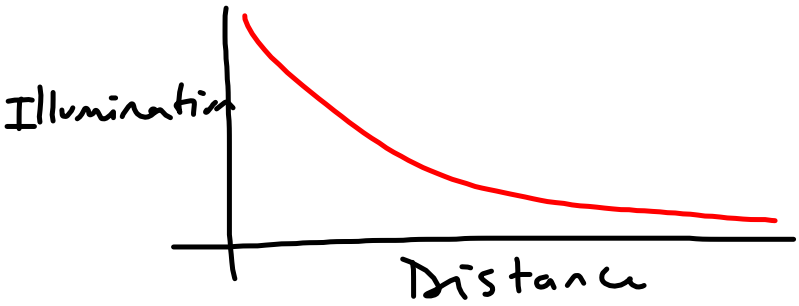
$= 1.05$

$F_N = F_g$

$= ma_g$

$= 12152N$

Light Intensity from source



	Distance	Illumination	Ratio of new to original illumination (new/original)
d	10	4400	
2d	20	1000	$\frac{1000}{4400} = \frac{1}{4.4} \approx \frac{1}{4}$
3d	30	400	$\frac{400}{4400} = \frac{1}{11} \approx \frac{1}{9}$
4d	40	250	$\frac{250}{4400} = \frac{1}{17.6} \approx \frac{1}{16}$

INVERSE SQUARE!

$$\frac{1}{d^2}$$

Most common functions in nature...

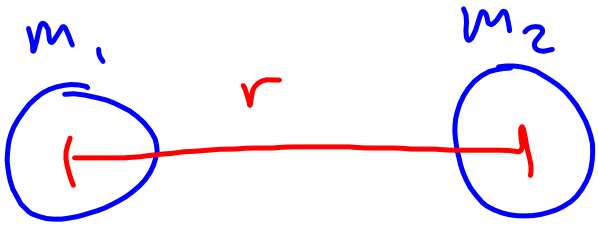
- x^2
- e^x
- x^1
- $\ln x$
- x^0
- x^{-1}
- x^{-2}

Newton's Law of Universal Gravitation

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

G → universal gravitation constant

$G = 6.67E-11 \ N \cdot m^2/kg^2$



$$a_g = \frac{G m_1}{r^2}$$

new radius	new gravitational field in terms of original gravitational field	new numerical value
$2r$	$g_{new} = \frac{GM_1}{(2r)^2} = \frac{GM_1}{4r^2} = \frac{1}{4}g$	$2.45\ m/s^2$
$3r$	$g_{new} = \frac{GM_1}{(3r)^2} = \frac{GM_1}{9r^2} = \frac{1}{9}g$	$1.09\ m/s^2$
$\frac{1}{2}r$	$g_{new} = \frac{GM_1}{(\frac{1}{2}r)^2} = \frac{GM_1}{\frac{1}{4}r^2} = 4g$	$39.2\ m/s^2$
$\frac{1}{3}r$	$g_{new} = \frac{GM_1}{(\frac{1}{3}r)^2} = \frac{GM_1}{(\frac{1}{9})r^2} = 9g$	