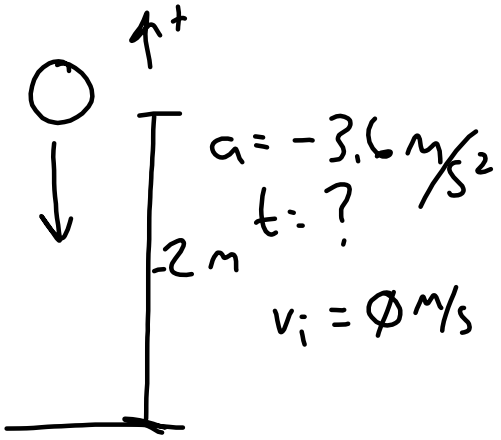
Exam Review → Part 2

12) Forces → opposite in direction, equal in magnitude

$a = \frac{F}{m}$ $a_{club} < a_{ball}$

13)



$$\Delta y = v_i t + \frac{1}{2} a t^2$$

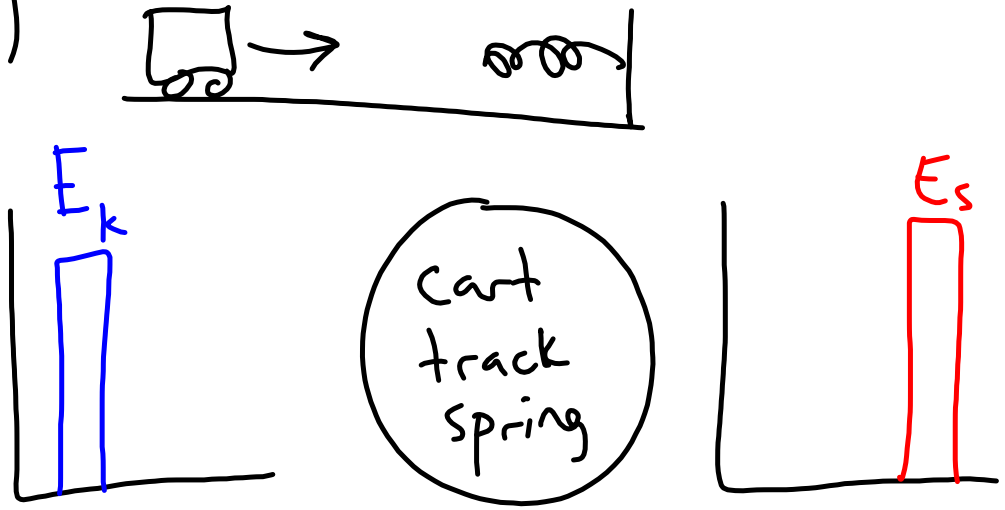
($v_i = 0$)

$$t = \sqrt{\frac{2\Delta y}{a}}$$

$$= \sqrt{\frac{2(2\,m)}{-3.6\,m/s^2}}$$

$$= 1.05\ s$$

14)



$$E_k = E_s$$

$$\frac{1}{2}mv_i^2 = \frac{1}{2}k(\Delta x)^2$$

$$k = \frac{mv_i^2}{(\Delta x)^2}$$

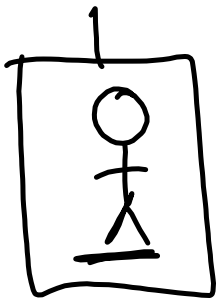
$$= \frac{(0.5\ kg)(3\ m/s)^2}{(0.22\ m)^2}$$

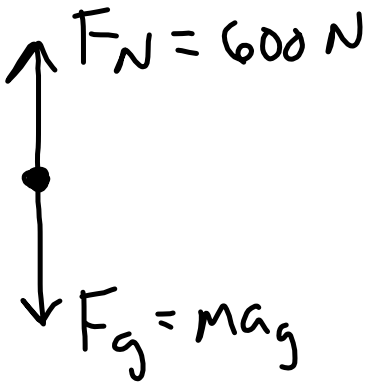
$$= 92.9\ kg/s^2$$

$F = -kx$

$k = \frac{F}{x}$

$\left[\frac{N}{m} = \frac{kg \cdot m/s^2}{m} = \frac{kg}{s^2}\right]$

15)  $\uparrow^+$



$\Sigma F = F_N - F_g$

$= 600N - 490N$

$= 110N$ $\Rightarrow$ implies that object has upward acceleration

$= (50\ kg)(9.8\ m/s^2)$

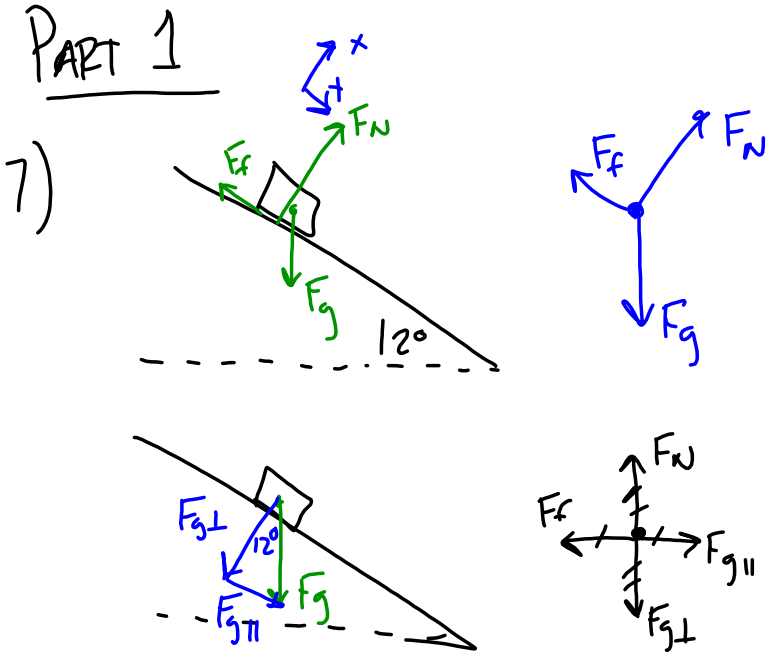
$= 490\ N$

$\Sigma \bar{F} = m\bar{a}$

$a = \frac{\Sigma F}{m} = \frac{110N}{50kg} = 2.2\ m/s^2$

PART 1

7)



$$\sum F_{\parallel} = \emptyset$$

$$F_{g\parallel} - F_f = \emptyset$$

$$F_f = F_{g\parallel} \qquad F_f = \mu F_N$$

$$\mu F_N = F_{g\parallel}$$

$$\mu = \frac{F_{g\parallel}}{F_N} \qquad \sum F_{\perp} = \emptyset$$

$$F_N - F_{g\perp} = \emptyset$$

$$= \frac{F_{g\parallel}}{F_{g\perp}} \qquad F_N = F_{g\perp}$$

$$= \frac{F_g \sin\theta}{F_g \cos\theta}$$

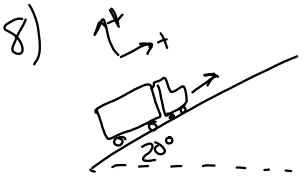
$F_{g\perp} = F_g \cos\theta$

$F_{g\parallel} = F_g \sin\theta$

$$= \tan\theta = \tan(12°)$$

$$= 0.21$$

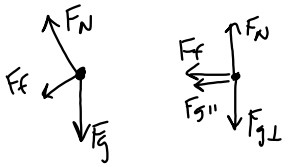
8)

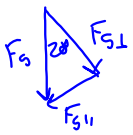


$V_i = 12\ m/s$

$\mu = 1.2$

$m = 2200\ kg$





$F_f = \mu F_N$

$= \mu F_{g\perp}$

$= \mu m a_g \cos(20°)$

$= (1.2)(2200\ kg)(9.8\ m/s^2)\cos(20°)$

$= 24311\ N$

$\sum \vec{F}_\perp = \emptyset$

$F_N - F_{g\perp} = 0$

$F_N = F_{g\perp}$

$= m a_g \cos(20°)$

$\sum \vec{F}_\parallel = m\vec{a}_\parallel$

$\vec{a}_\parallel = \frac{\sum \vec{F}_\parallel}{m} = \frac{-F_f - F_{g\parallel}}{m}$

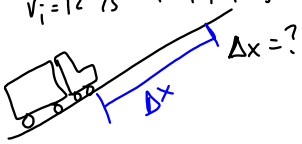
$= \frac{-F_f - m a_g \sin(20°)}{m}$

$= \frac{-24311\ N - (2200\ kg)(9.8\ m/s^2)\sin(20°)}{2200\ kg}$

$= -14.4\ m/s^2$

How far?

$v_i = 12\ m/s \quad a = -14.4\ m/s^2 \quad v_f = \emptyset\ m/s$



$v_f^2 = v_i^2 + 2a\Delta x$

$\Delta x = \frac{v_f^2 - v_i^2}{2a}$

$= \frac{(\emptyset\ m/s)^2 - (12\ m/s)^2}{2(-14.4\ m/s^2)}$

$= 4.9\ m$