Phy 4A 10/12

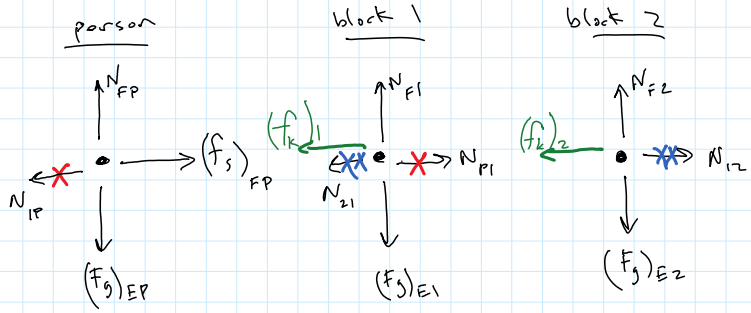
Wednesday, October 12, 2016 10:01 AM

Goals for the Lecture:

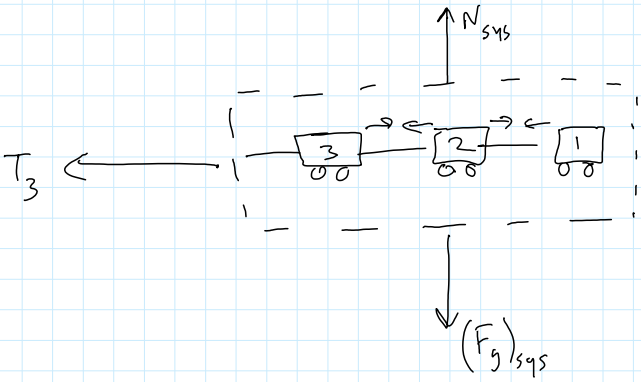
1) Use Newton's Second Law to solve motion problems involving forces and acceleration
2) Be able to draw free body diagrams for objects on incline surfaces
3) Be able to calculate static and kinetic friction forces

Worksheet II-5

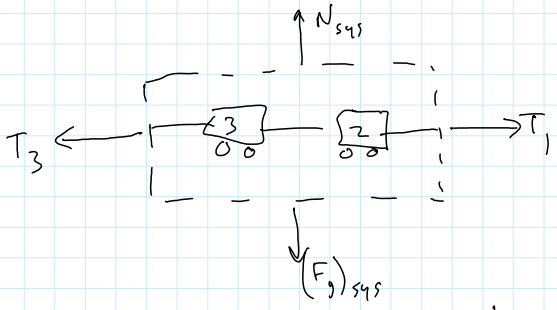
Now, with friction



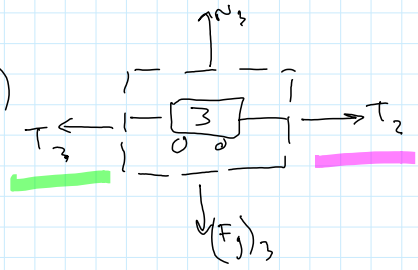
II-6 a) i)



ii)



iii)



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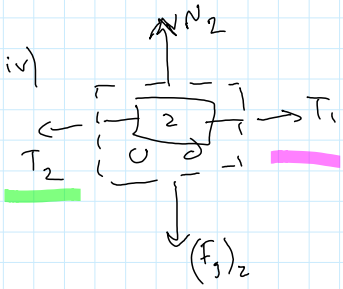
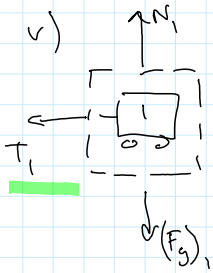
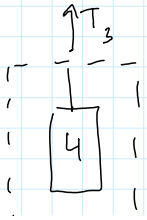


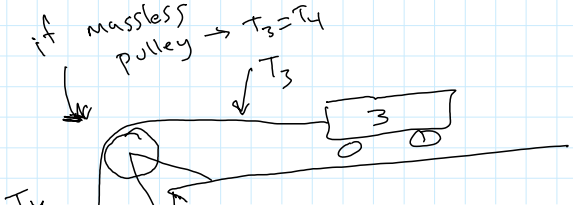
v)

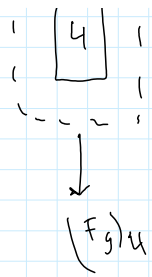


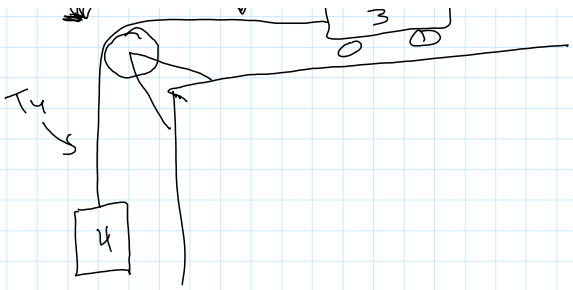
vi)



if massless pulley → $T_3 = T_4$







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

$$\sum F_x = m a_x \quad \overset{+}{\leftarrow} \qquad \sum F_y = m a_y$$

For carts 1, 2, and 3

$$T_3 - T_2 + T_2 - T_1 + T_1 = (m_1 + m_2 + m_3)\, a$$

$$T_3 = (M_1 + M_2 + m_3)\, a$$

$$m_1 = m_2 = m_3 = M$$

$$T_3 = 3Ma$$

cart 1

$$\sum F_x = m_1 a$$

$$T_1 = Ma$$

cart 2

$$\sum F_x = m_2 a$$

$$T_2 - T_1 = Ma$$

$$T_2 = Ma + T_1$$

$$= 2Ma$$

$$= 2T_1$$

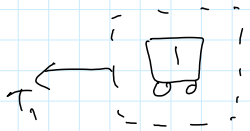
cart 3

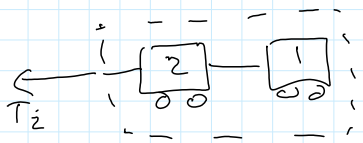
$$\sum F_x = m_3 a$$

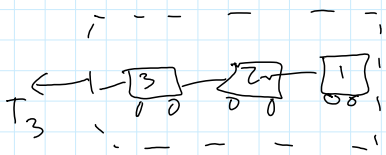
$$T_3 - T_2 = Ma$$

$$T_3 = 3Ma$$

$$= 3T_1$$







Find F_{Net} on each: Same for all three

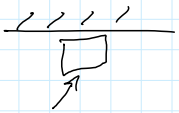
$$\sum F = Ma$$

Worksheet II-7

Left

a) B
b) A
c) G
d) E

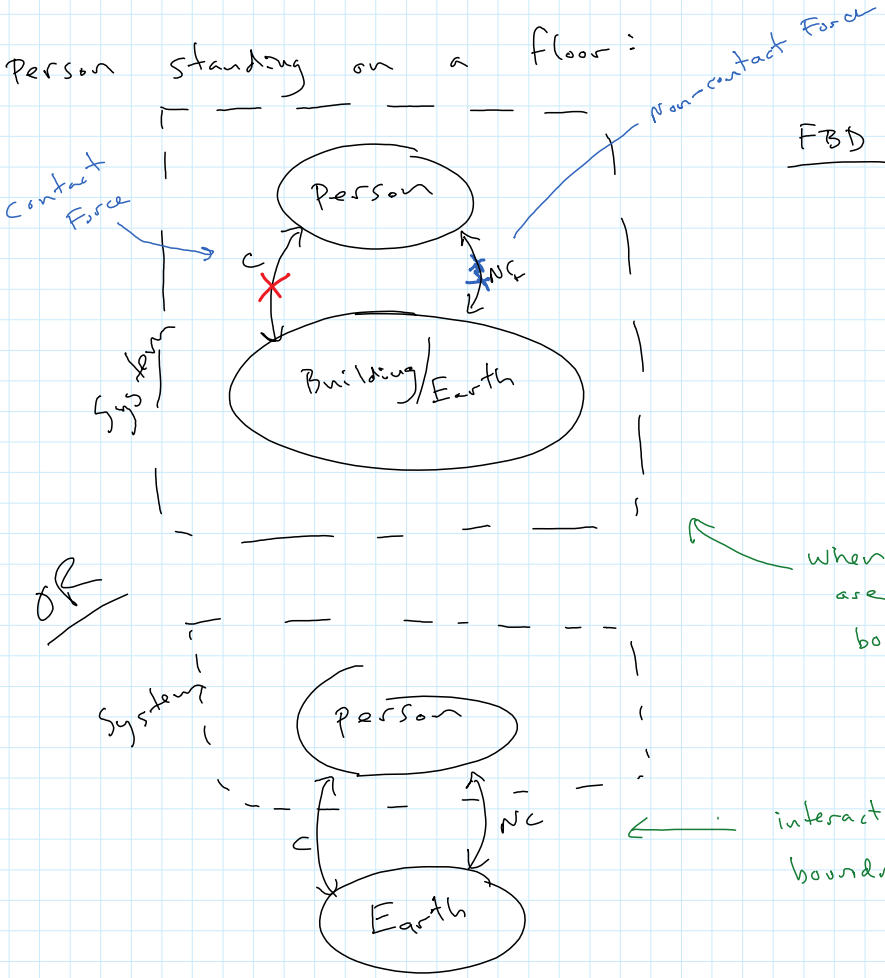
Right



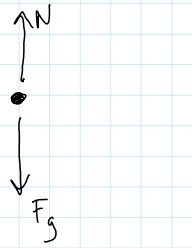
a) E
b) G
c) A
d) C
e) hands Not sliding or moving along box → static
f) E

System Schema:

Person standing on a floor:



FBD for Person

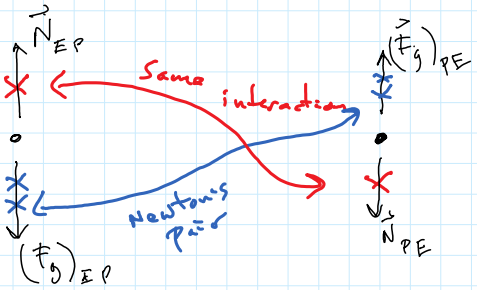


when all interactions are within the system boundry → Energy is conserved

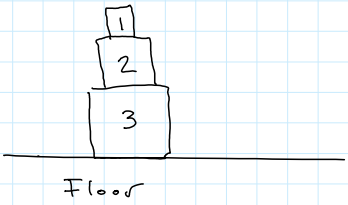
interactions crossing system boundry → Energy Not conserved

FBD Person

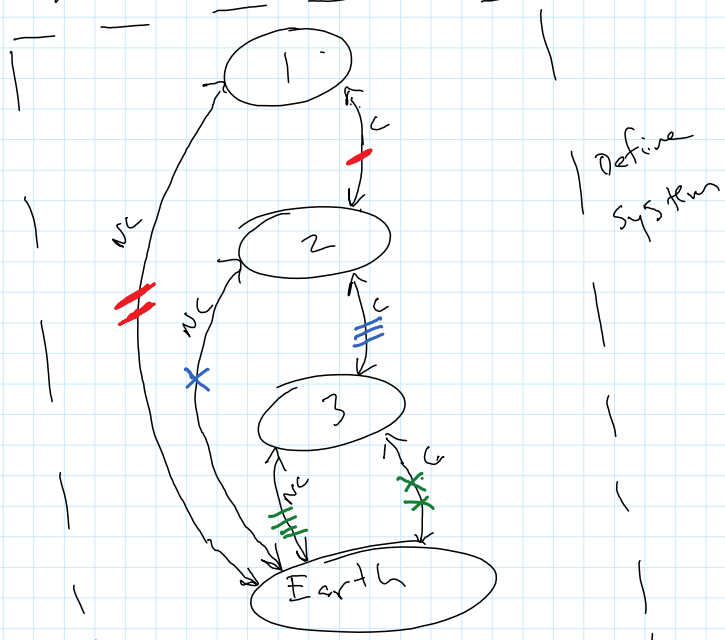
FBD Earth



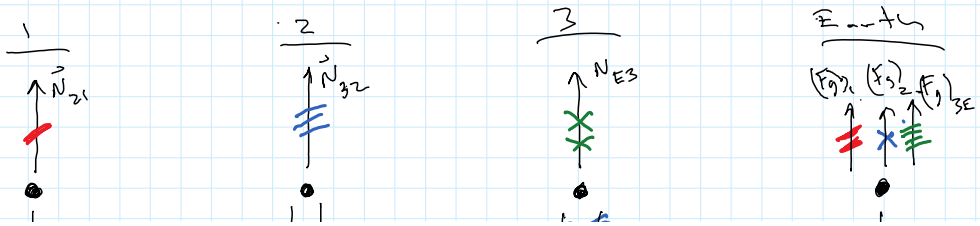
Same interaction = Newton's 3rd Law Pair

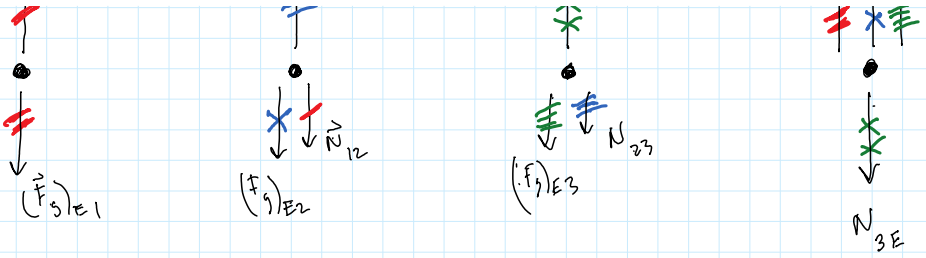


Draw a system Schema:



FBD for each object:





Worksheet P. 85

Top: all the same (zero)

Now, with acceleration $\vec{a} = 3\ \frac{m}{s^2} \rightarrow$

$\vec{v} = 2\ \frac{m}{s} \rightarrow$

Net force on each block:

A) $F_{Net} = Ma = (2M)(3) = 6M \rightarrow$

B) $F_{Net} = (4M)(3) = 12M \rightarrow$

C) $9M \rightarrow$

D) $15\ M \rightarrow$

E) $3\ M \rightarrow$

Bottom: F_{Net}: zero for all

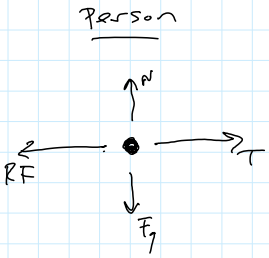
Find tension in each rope:

$T_A = 750\ N$

$T_B = 800\ N$

$T_C = 900\ N$

$T_D = 750\ N$



Let $m = 50\ kg$ and $\vec{a} = 2\ \frac{m}{s^2} \rightarrow$

Find T in each rope:

1st Find F_{Net}: $\vec{F}_{Net} = m\vec{a} = (50)(2) = 100\ N \rightarrow$

$T_A = 850\ N$ $(750 + 100)$

$T_B = 900\ N$

$T_C = \quad N$

$T_C = 1000$ N

$T_D = 850$ N

Now, let $m = 50$ kg and $a = 2 \frac{m}{s^2} \leftarrow$

$\rightarrow +$

$F_{Net} = (50 \text{ kg})\left(-2 \frac{m}{s^2}\right) = -100$ N or 100 N $\leftarrow$

$T - RF = -100$ N

$T_A = 650$ N

$T_B = 700$ N

$T_C = 800$ N

$T_D = 650$ N