Phy 2A 4/26

Wednesday, April 26, 2017 9:13 AM

Goals for the Lecture:

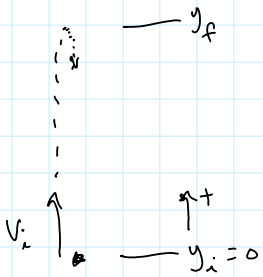
1) Understand Newton's First Law, inertia, and the role it plays in motion
2) Understand Newton's Second Law, forces, and the role they play in acceleration
3) Be able to draw free body diagrams for objects on flat surfaces

Kinematics Prob from Exam:

1st) Find V_i using straight up motion:

straight up

y_i	0
y_f	y_f
V_{iy}	?
V_{fy}	0 (at highest pt)
a_y	$-9.8 \frac{m}{s^2}$
t	X

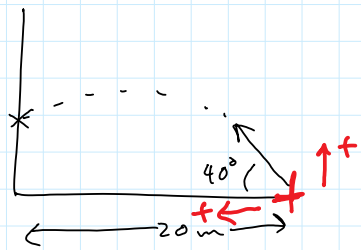


$$V_f^2 = V_i^2 + 2a\Delta y$$

$$0 = V_i^2 + 2a(y_f - y_i)$$

↑ Solve for V_i

2nd) 2-D Problem



x-motion

x_i	0
x_f	20
V_{ix}	$V_i \cos 40°$
V_{fx}	same
a_x	0
t	

y-motion

y_i	0
y_f	?
V_{iy}	$V_i \sin 40°$
V_{fy}	X
a_y	$-9.8 \frac{m}{s^2}$
t	

use x to solve for time

$$t = \frac{\Delta x}{V_x} = \frac{20}{V_i \cos 40°}$$

use t in y-motion

solve for y_f using:

$$y_f = y_i + v_{iy} t + \frac{1}{2} a_y t^2$$

Newton's Laws:

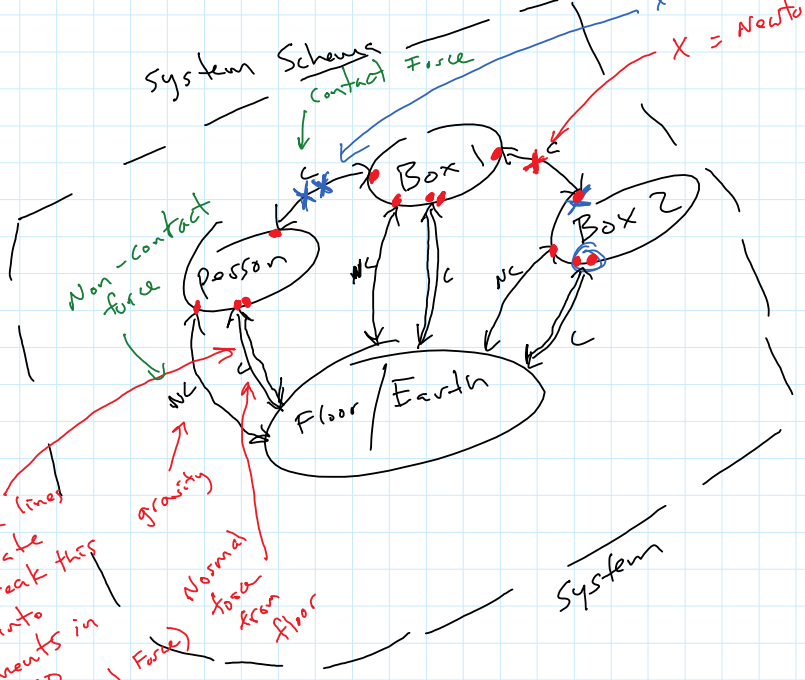
1) Inertia

2) $\vec{F}_{Net} = m\vec{a}$ or $\vec{a} = \frac{\vec{F}_{net}}{m}$

3) Force is an interaction between 2 objects

$$\vec{F}_{A \to B} = -\vec{F}_{B \to A}$$

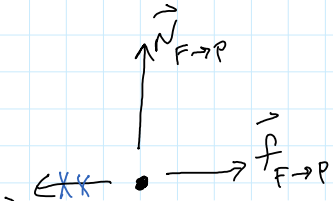
Person Pushing two boxes across floor:
(boxes slide across floor to the right)



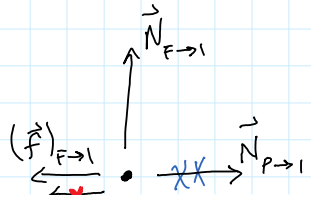
N = Normal force
f = friction force
F_g or W = force of gravity or weight

Free Body diagrams:

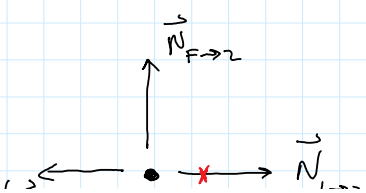
person

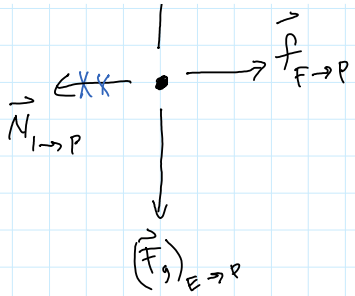


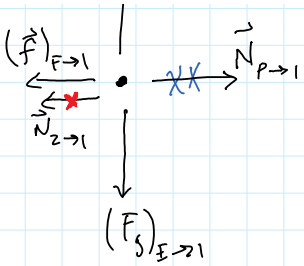
box 1

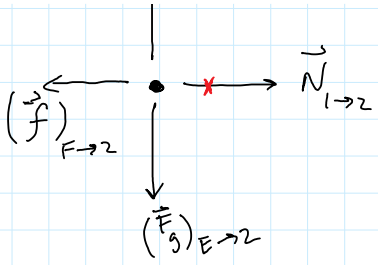


box 2



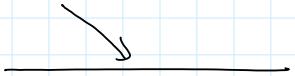






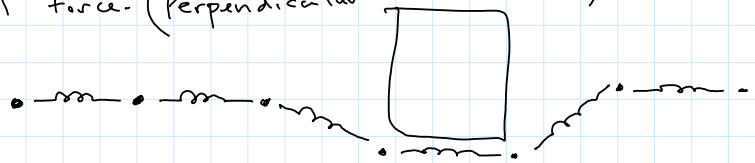
side Note about surfaces:

Push on a surface w/ your hand

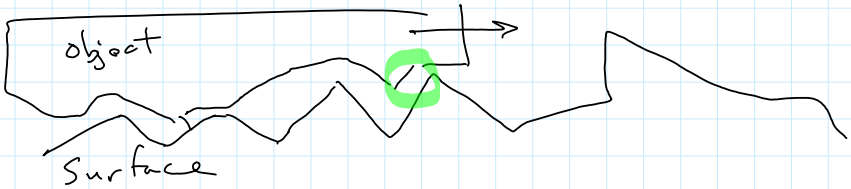


Force of surface on hand

Normal Force: (Perpendicular to surface)



friction: (parallel to surface)



Worksheet II-7

Left:

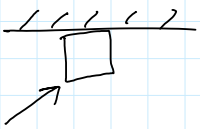
a) B

b) A

c) G

d) E

Right:



a) E

b) G

c) A

d) C

d) E

d) C

e) No sliding between hand & block (moving together)

f) E

Applications: Inertia

- Seat belts
- Chips and Salsa
- Cutting Pancakes
- Shaking objects to see which is heavier
- getting ketchup out of the bottle

Worksheet p. 85

Top: $F_{net} = m\cancel{a}^{0} = 0$

all the same (zero)

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

Find Net force on each one:

A) $\vec{F}_{net} = ma = (2M)(3) = 6M \rightarrow$

B) $\vec{F}_{net} = (4M)(3) = 12M \rightarrow$

C) $\vec{F}_{net} = (3M)(3) = 9M \rightarrow$

D) $(5M)(3) = 15M \rightarrow$

E) $(M)(3) = 3M \rightarrow$

Bottom: $F = m\cancel{a}^{0}$

all are zero

Now, Find the tension in each rope