Phys 2110-5 9/19/12

Note Title 9/19/2012

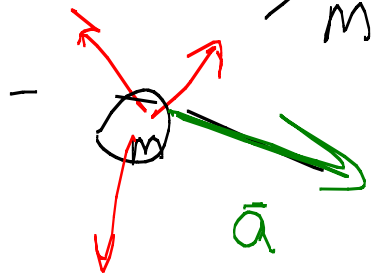
$$\vec{F}_{net} = m\vec{a}$$

Newton's 2nd Law

Net force add vectors.

$$\vec{a} = \vec{F}_{net}/m$$

One acceleration



Units: $\frac{kg\ m}{s^2} = N$

$$F_{net_x} = ma_x \qquad F_{net_y} = ma_y$$

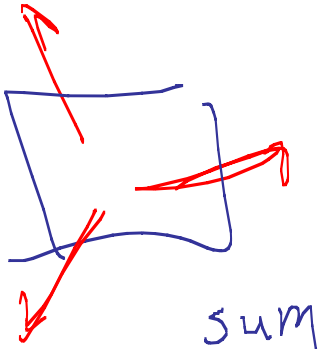
Deeper issues:

$\vec{F} = m\vec{a}$ not a definition

Theory makes predictions

suppose $\vec{F}_{net} = 0$

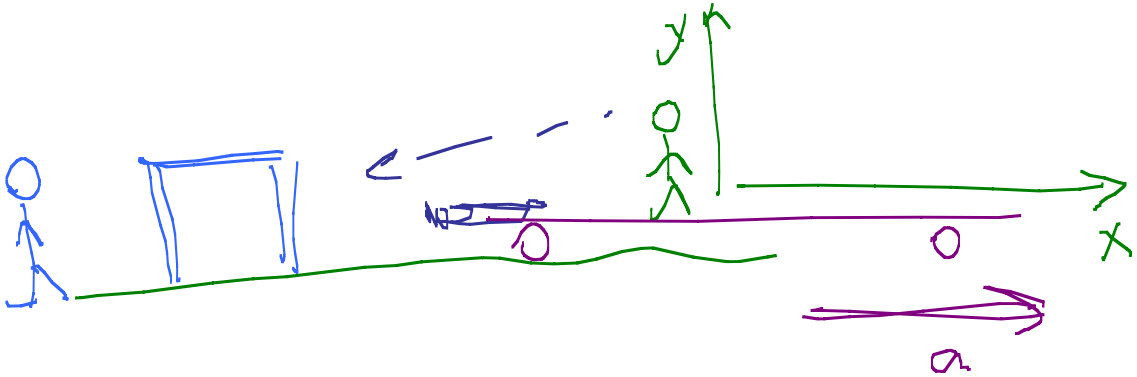
$\vec{F}_{net} = m\vec{a}$



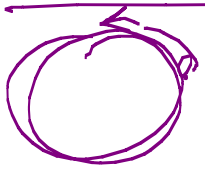
sum = $\vec{0}$ $= \vec{a} = 0$

Reference Frames

$\Rightarrow$ constant velocity



Inertial Frames



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$$\vec{F}_{net} = m\vec{a}$$

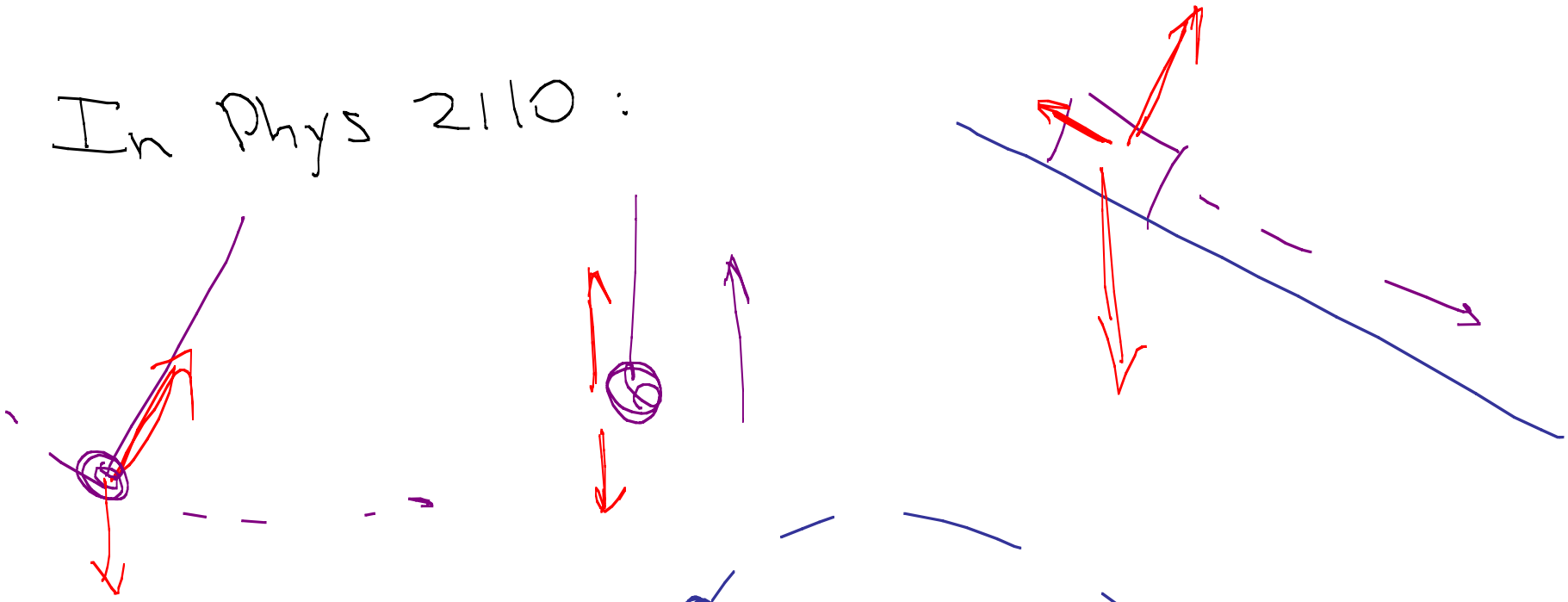
Solve problems w/ forces and accel's

Fundamental Forces

- Gravity
- Electromagnetic
- Nuclear Weak Force
- Nuclear Strong Force

→ Responsible for every day phenomena

In Phys 2110:



Gravity

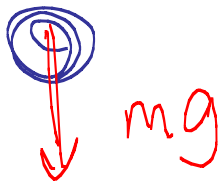
$\vec{a} = -g\hat{j}$

$\vec{F}_{grav} = -mg\hat{j}$

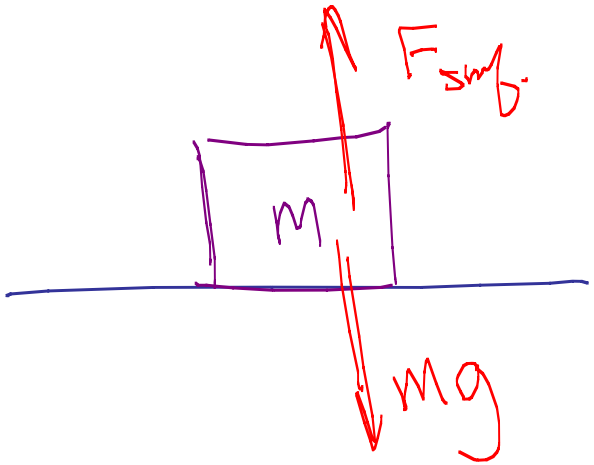
Force is proportional to mass

$|F_{grav}| = mg = ma$

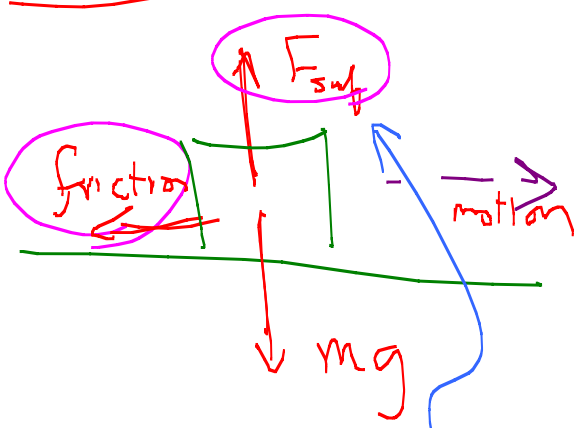
$a = g$



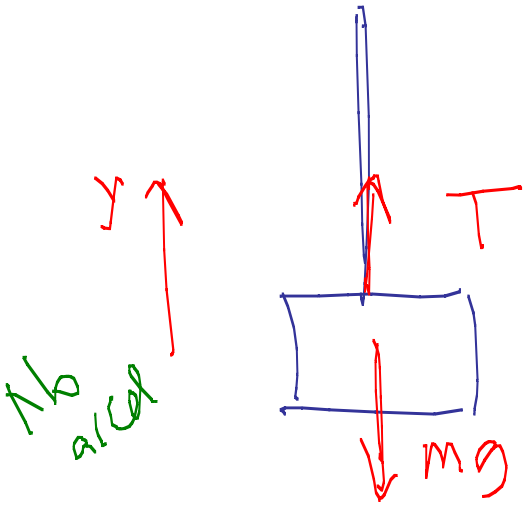
Surface



Smooth, motion



Strings



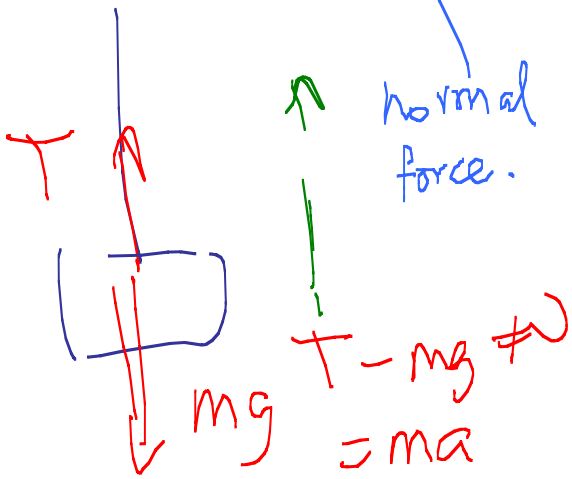
String pull inward along length

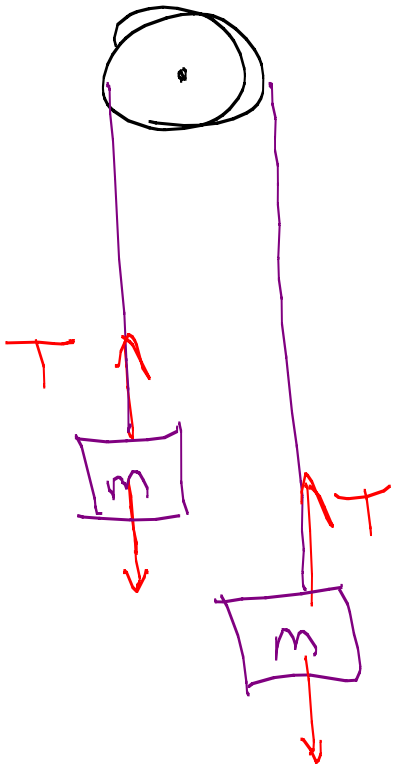
Tension in string

$T - mg = 0$ (Hangs.)

$= ma = 0$

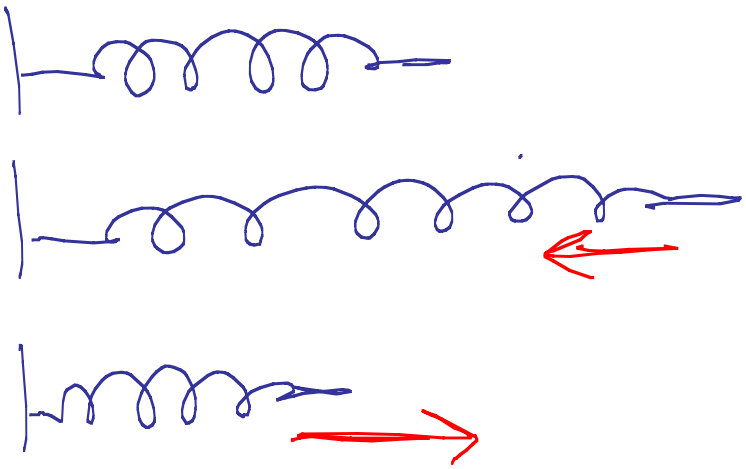
friction



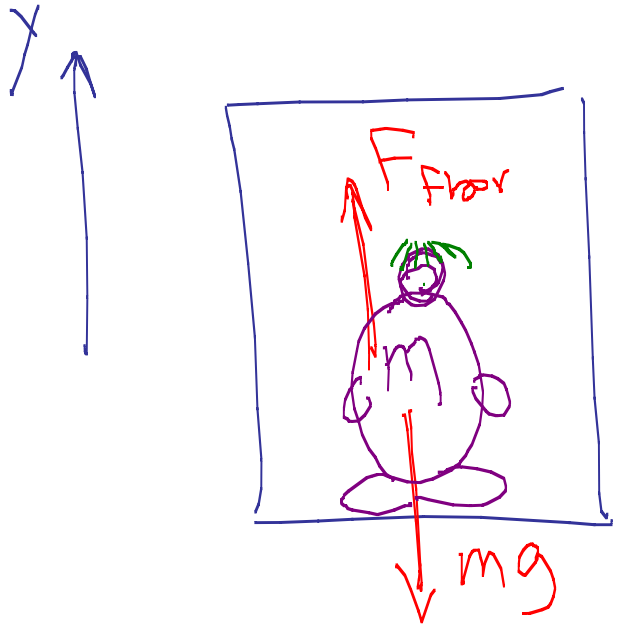


For now T is same on both ends

Spring, later



4.29 An elevator accelerates downward at $2.4\ m/s^2$. What force does the elevator's floor exert on a 52-kg passenger?



Draw all forces. !!!

Draw the diagram !!!

Draw the Free Body Diagram

$a_y = -2.4\ m/s^2$

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$$F_{net,y} = ma_y$$

$$F_{floor} - mg = ma_y$$

$$F_{floor} = mg + ma_y = m(g + a_y)$$

apparent weight

$$= (52\,kg)\left(9.8\,\frac{m}{s^2} - 2.4\,\frac{m}{s^2}\right)$$

$$= \boxed{384\ N}$$

mg = weight = $(52\,kg)(9.8\,\frac{m}{s^2}) = 510\ N$

weight

mag of force of grav