

## PHY138 - Mechanics - Class 5 - Sept 25/06

Cut and pasted from last class:

Free Fall



$$a_y = -g$$

$$= -9.80 \text{ m/s}^2$$

$$|\vec{a}| = g > 0$$

$$s = \frac{1}{2} a_y t^2$$

If context is clear:  $s = \frac{1}{2} a t^2$

Not  $a = |\vec{a}|$  - just sloppy

CHAPTER 4 - FORCES & MOTION

Largely descriptive

Follow text more than usual.

§4.1 Contact Forces.  
a Electric Force (Q3)

§4.2 Catalog of Forces NTA for now

§4.3 Identifying Forces:

System: "object"  
Environment: "agent"

Make distinction clear in your  
own mind.

Don't change in the middle of  
the problem

§4.4 } combine  
§4.5 }

$N$  rubber bands

Each exerts  $\vec{F}$  when stretched  
to "standard length"

$$\vec{F}_N = N\vec{F}$$

Mount band to air puck

Keep stretched to standard length

Measure puck's acceleration

$$a \propto F_{\text{total}}$$

"proportional to"

$$a = c F_{\text{total}}$$

$$\text{slope} = \frac{1}{m}$$

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

Newton's 2<sup>nd</sup>  
Law

dependent variable  $\rightarrow y = f(x)$  independent variables

changes in  $x$  cause changes in  $y$

$$F = ma$$

$$a = \frac{1}{m} F$$

§4.6 1<sup>st</sup> Law "Principle of Inertia"

$$\vec{F}_{\text{net}} = 0 \Rightarrow \vec{a} = 0$$

Galileo (1600) part way there

Descartes (1633) - 1<sup>st</sup> realisation.

Only true in inertial reference frames /

{ stationary or in uniform  
relative to absolute  
space

# CHAPTER 5

Dynamics! effect of forces  
on objects

## § 5.1 - Equilibrium

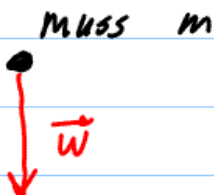
## § 5.2 Using Newton's Laws

Go through examples

## § 5.3 - Mass & Weight

↖ amount of matter  
Chapt 4!

Near Earth's surface



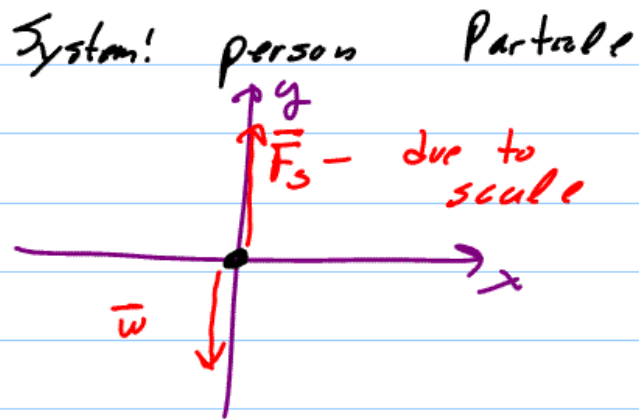
free fall  
 $\vec{a} = \frac{g}{5}$

$$\vec{a} = (g, \text{down})$$

"the weight"  $|\vec{w}|$

Example

elevator  
accelerates up.



$$F_{\text{net}} = F_S - w = ma_y$$