

Physics 100 - September 10, 2007

- Recitations start next week
- e-mail distribution
- URL for class website

http://web.pas.rochester.edu/~manly/class/P100_2007F/

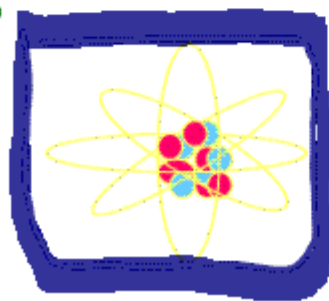
Last time

The Human Experience is a very tiny fraction of what the universe offers



large

Perhaps we should expect surprises



Small

The Human Experience



Science

A methodology for seeking to understand the world around us.

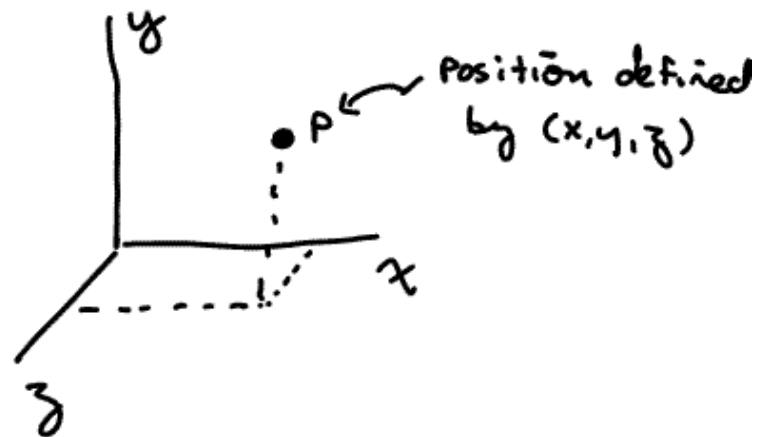
*Science bows
before experiment*

What do you need to describe simple motion

Position Spatial
 x or y

need coordinate system

Cartesian



time

need a concept of time to discuss change in position

Ave Speed $\frac{\Delta x}{\Delta t}$

$\Delta \equiv$ "change in"

no direction

Ave velocity $\frac{\Delta x}{\Delta t}$

with
direction

Average Acceleration

$$\frac{\Delta v}{\Delta t}$$

with direction

instantaneous
Speed
Velocity
Acceleration

x, v, a, t

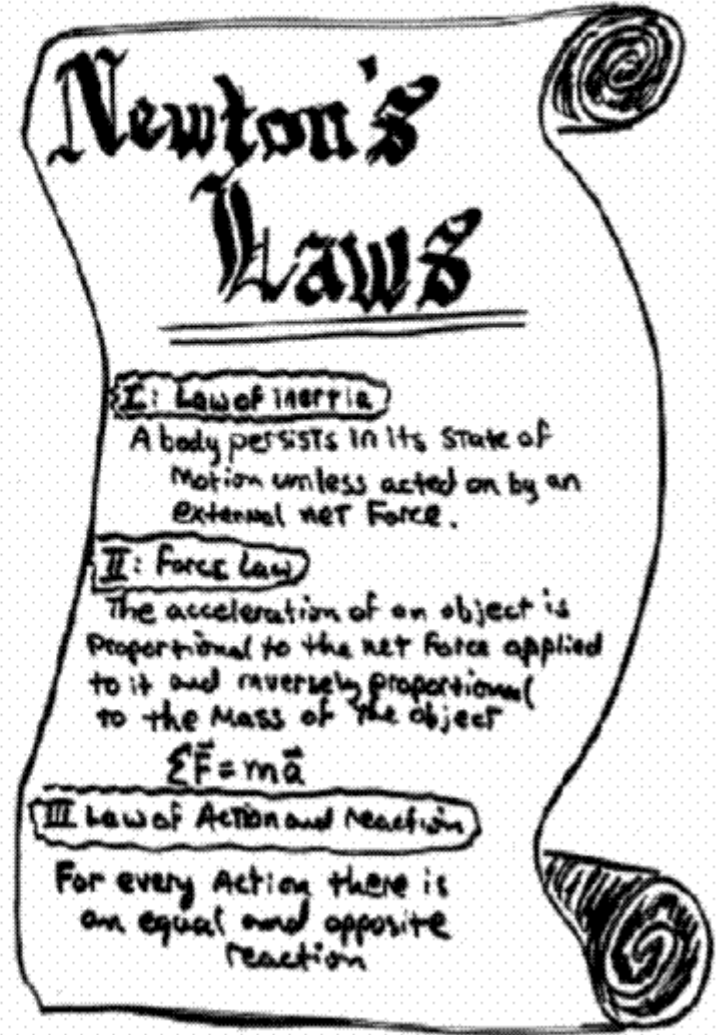
Kinematic variables

How kinematic variables relate to forces ... handed down to us by Newton →

If we know x, v of all objects in universe as well as forces on each object and the mass of each object

⋮
Put all into a computer

⋮
could predict the future!



$$v = \frac{\Delta x}{\Delta t}$$

$$a = \frac{\Delta v}{\Delta t}$$

$$F = ma$$

Newton's 2ND Law
relates accel.
to Force

$$F = m \frac{\Delta v}{\Delta t}$$



if know forces

Newton's Laws

+

Kinematical definitions


Inertia

$$v = \frac{\Delta x}{\Delta t}$$

$$F = ma$$

$$a = \frac{\Delta v}{\Delta t}$$

Action-reaction



Allows us to make detailed calculations/predictions
of how objects respond/move under
the influence of forces

Forces gravitation

$$F_{\text{grav}} = G \frac{M_1 M_2}{r^2}$$



"inverse square" force

Always ATTRACTIVE



Newton

Electromagnetic force

Electric charge

+ Positive

- Negative

$$F = k \frac{Q_1 Q_2}{r^2}$$



Both ATTRACTIVE + repulsive

Coulomb