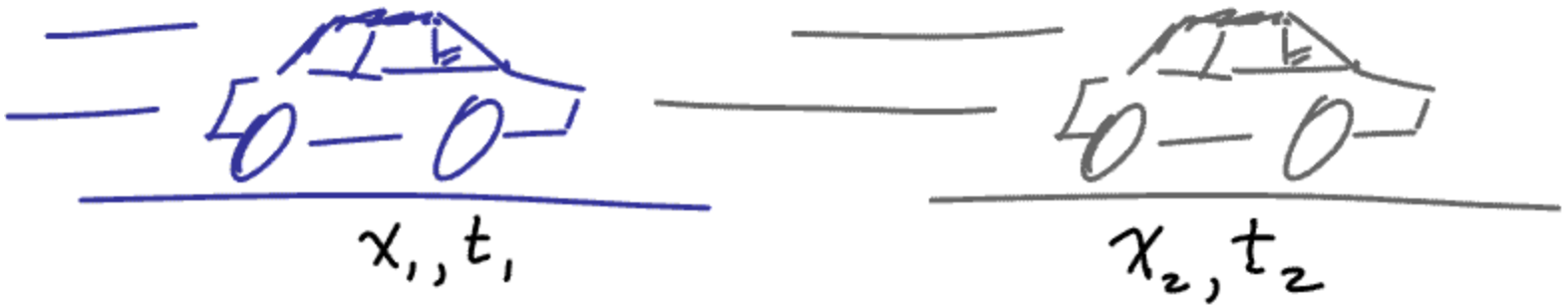
Physics 102 - September 14, 2009

- Reading Posted
- Recitations Start Today

Last Time

Nature of Science

Science laws before Experiment



$$\frac{x_2 - x_1}{t_2 - t_1} = \frac{\Delta x}{\Delta t} = \text{Average Speed}$$

+ direction $\rightarrow$ Ave. velocity

V_3, t_3 V_4, t_4

Ave. Acceleration $\frac{V_4 - V_3}{t_4 - t_3} = \frac{\Delta v}{\Delta t} = a$

x, v, a, t Kinematic variables

Newton's Laws

I: Law of Inertia

A body persists in its state of motion unless acted on by an external net Force.

II: Force Law

The acceleration of an object is proportional to the net force applied to it and inversely proportional to the mass of the object

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

III Law of Action and Reaction

For every Action there is an equal and opposite reaction

Newton's Laws + Kinematical def.

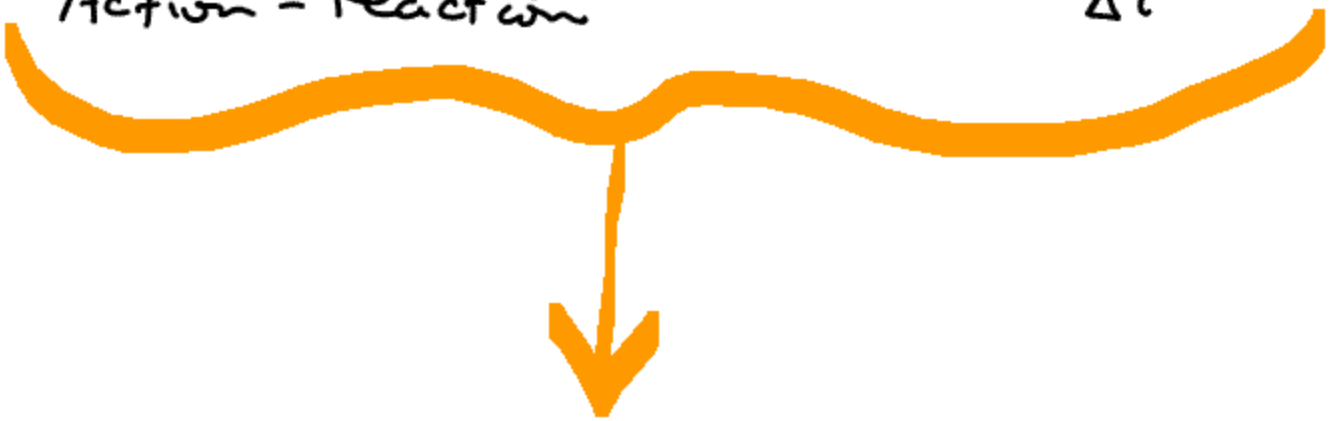
Inertia

$F = ma$

Action - reaction

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

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

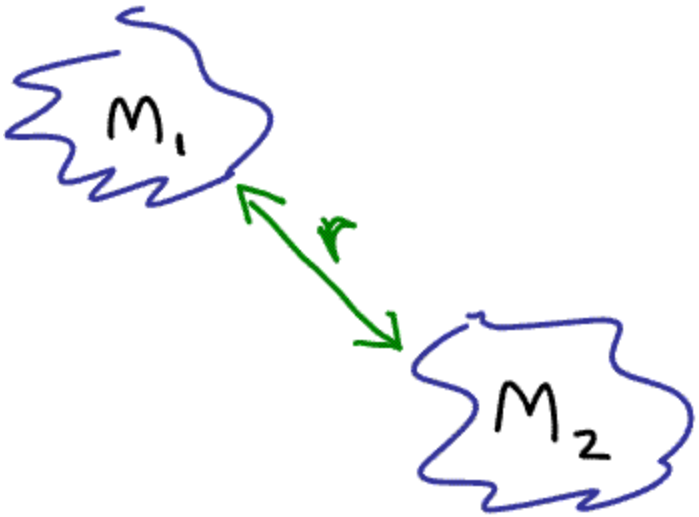


Make calculations/predictions of motions of objects under the influence of forces

Deterministic Universe

gravitation

$$F_{grav} = G\frac{m_1 m_2}{r^2}$$



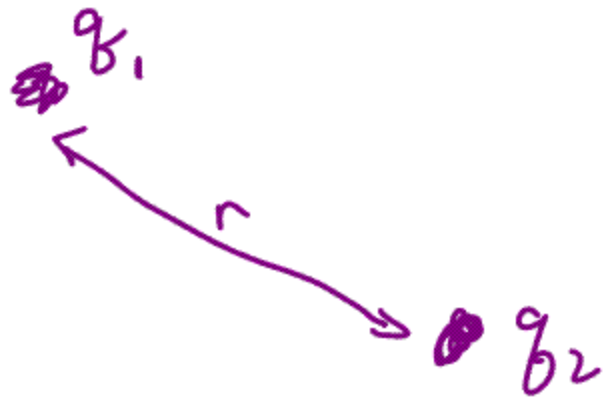
Attractive

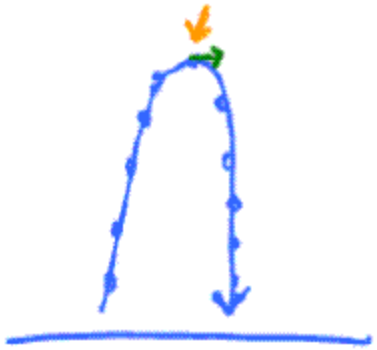
Electromagnetic Force

(Electrostatic force)

Coulomb's law

$$F_{em} = k\frac{q_1 q_2}{r^2}$$





Battery tossed in air

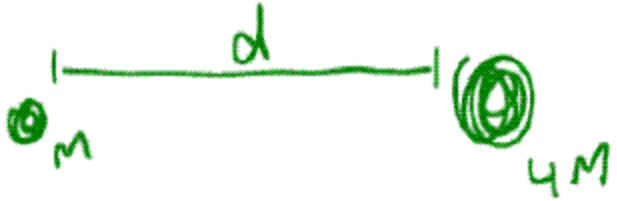
$F = ma$

F_{same}, a_{same} all pts

Newton's Laws of Motion can be subtle

Two stars a distance d apart
Star ① has mass m
Star ② has mass $4m$

How does the gravitational attraction of Star ① for Star ② compare to the grav. attraction of Star ② for Star ①?



Action reaction forces the SAME