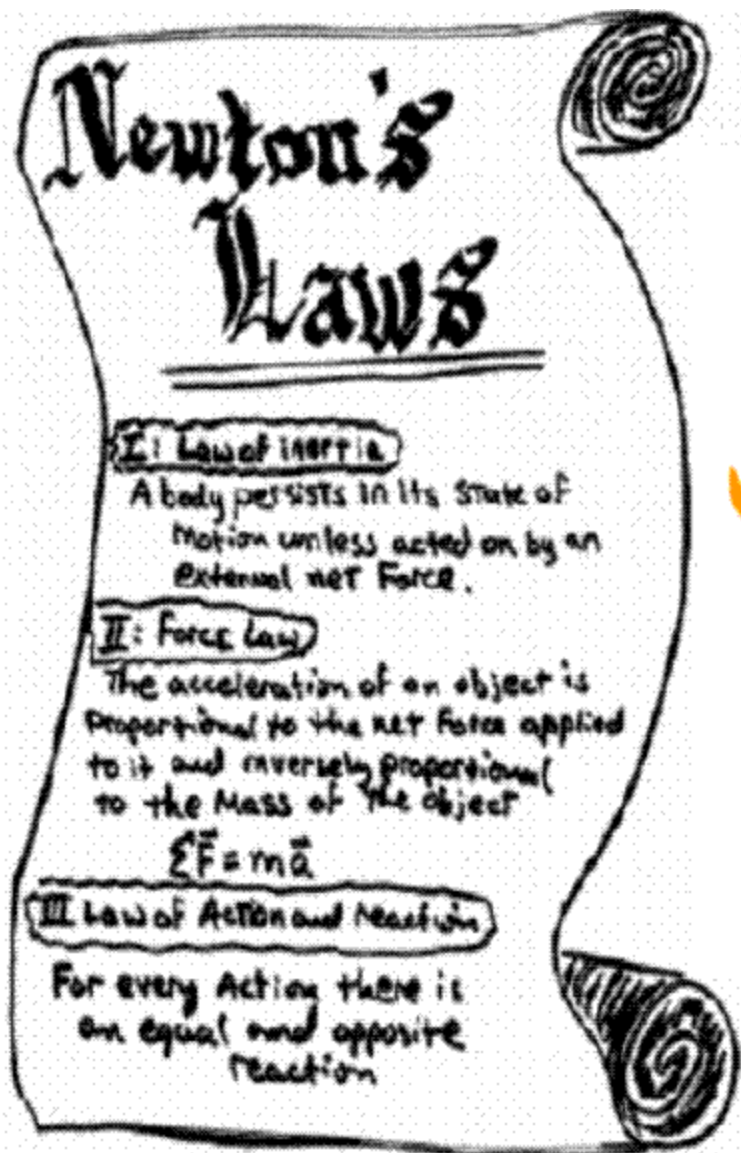


# Physics 102 - September 16, 2009

- Recitations
- Problem Set 1, Prob set 2
- Problem set solutions



Newton's Laws + kinematical definitions

Inertia

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

$$F = ma$$

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

Action-reaction

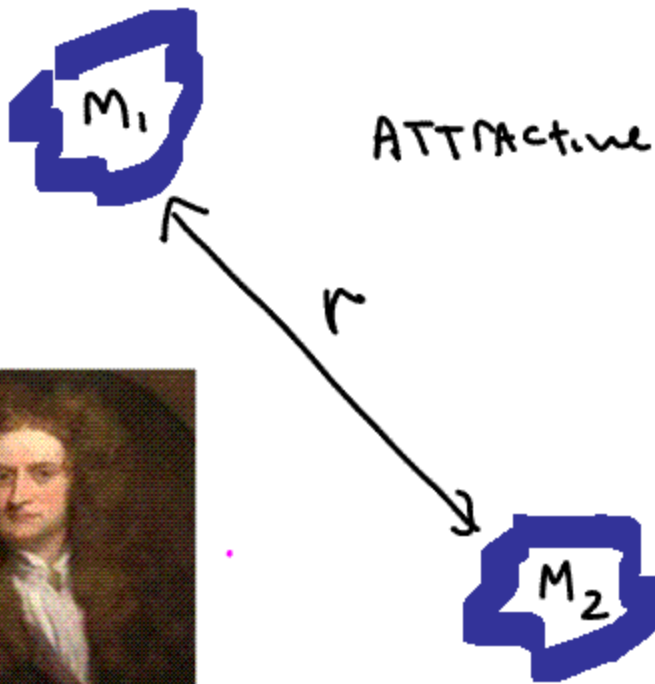


Allows us to make detailed calculations/predictions of how objects respond/move under the influence of forces

Deterministic  
universe

# gravitation

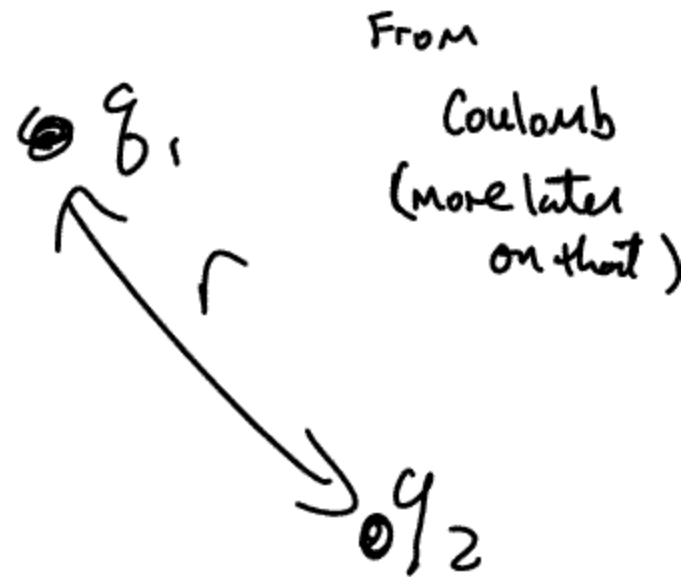
$$F_{\text{grav}} = \frac{GM_1M_2}{r^2}$$



Isaac Newton

# Electromagnetic Force

$$F = \frac{kq_1q_2}{r^2}$$



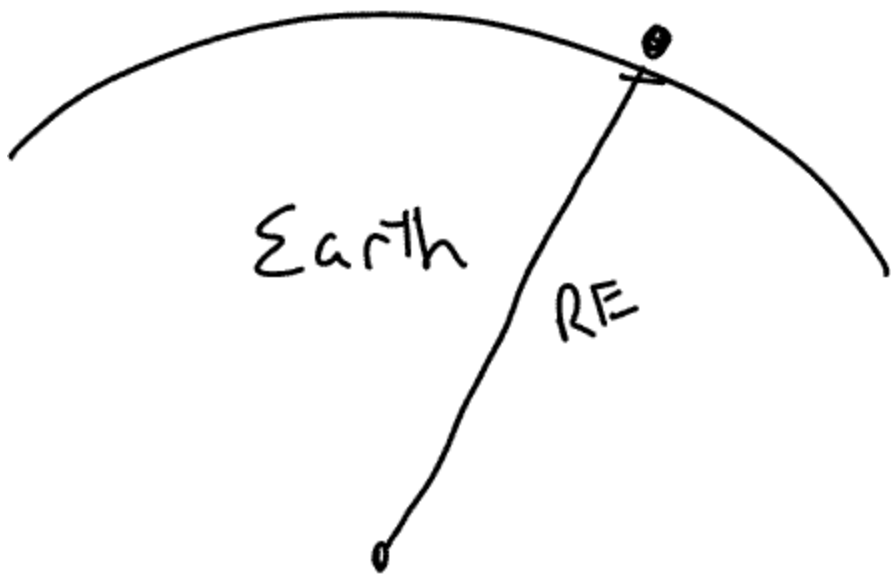
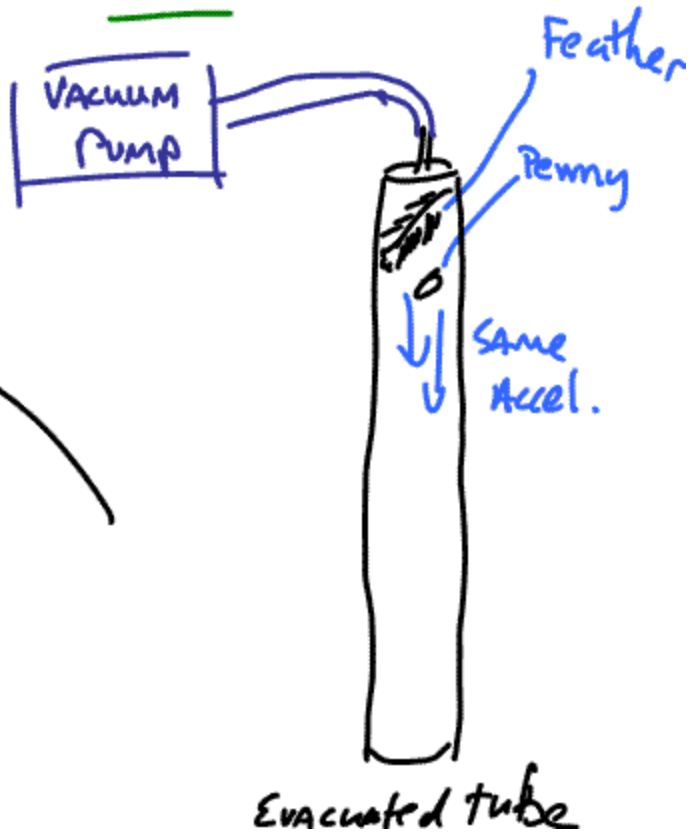
See Coulomb Force Applet

$$F = \frac{G M_E M}{R_E^2}$$

$$g \approx 9.8 \text{ M/S}^2$$

acceleration

Demo



## Gravitational Force

$$F = \frac{GMm}{r^2}$$

$$\frac{F_{\text{TEST MASS}}}{M_{\text{TEST MASS}}} = \text{GRAV. FIELD at point}$$

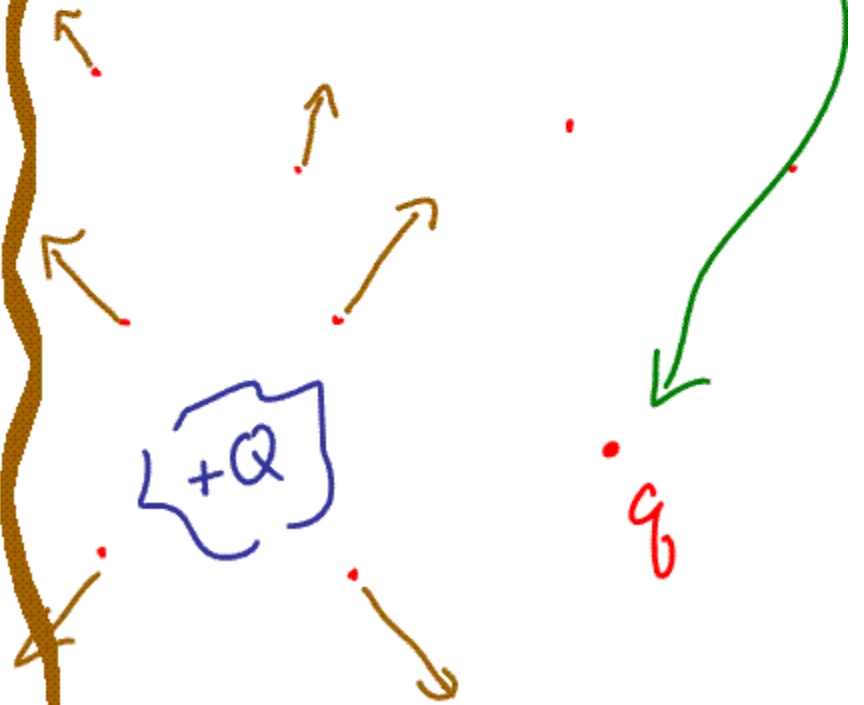
$$\text{grav. field mag} = \frac{GM}{r^2}$$



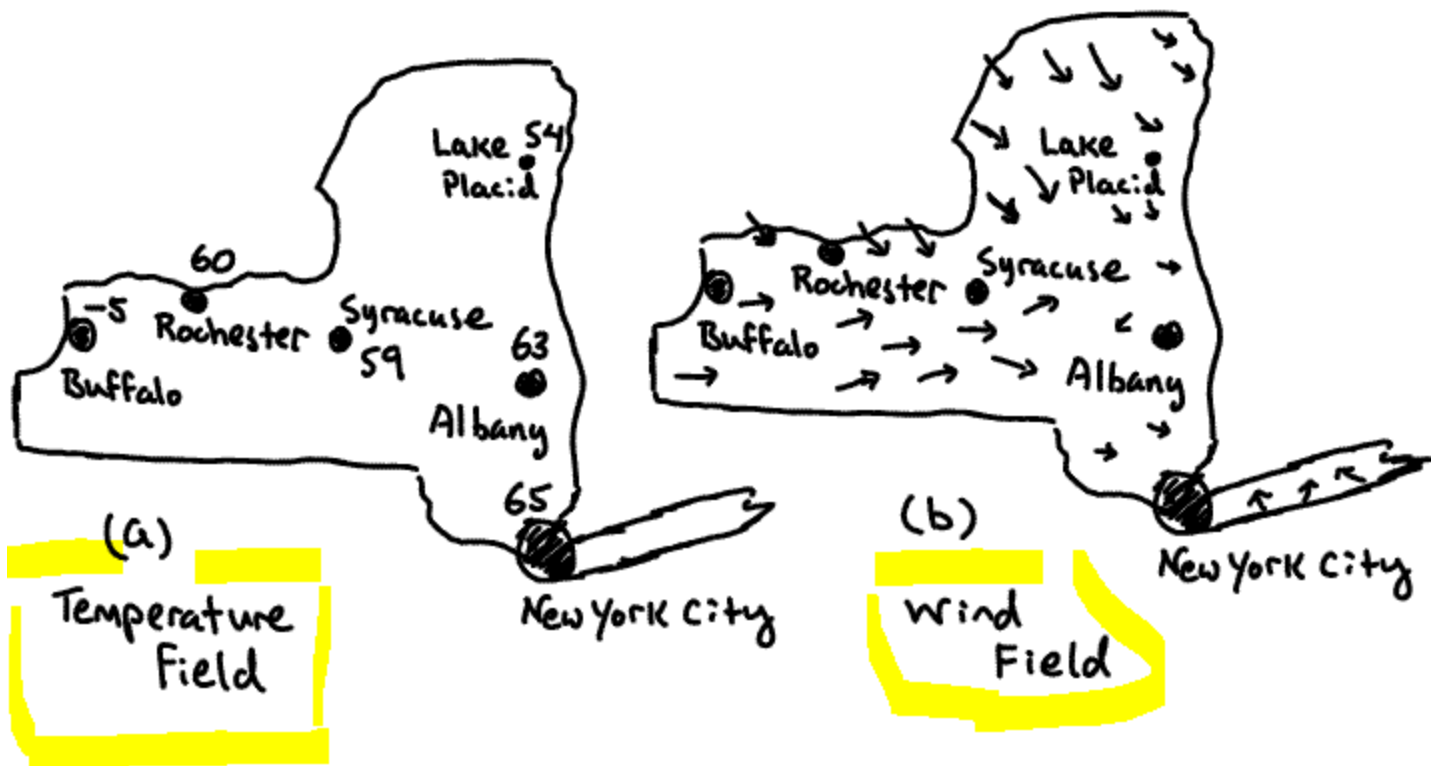
## Electromagnetic Force (Coulomb's Law)

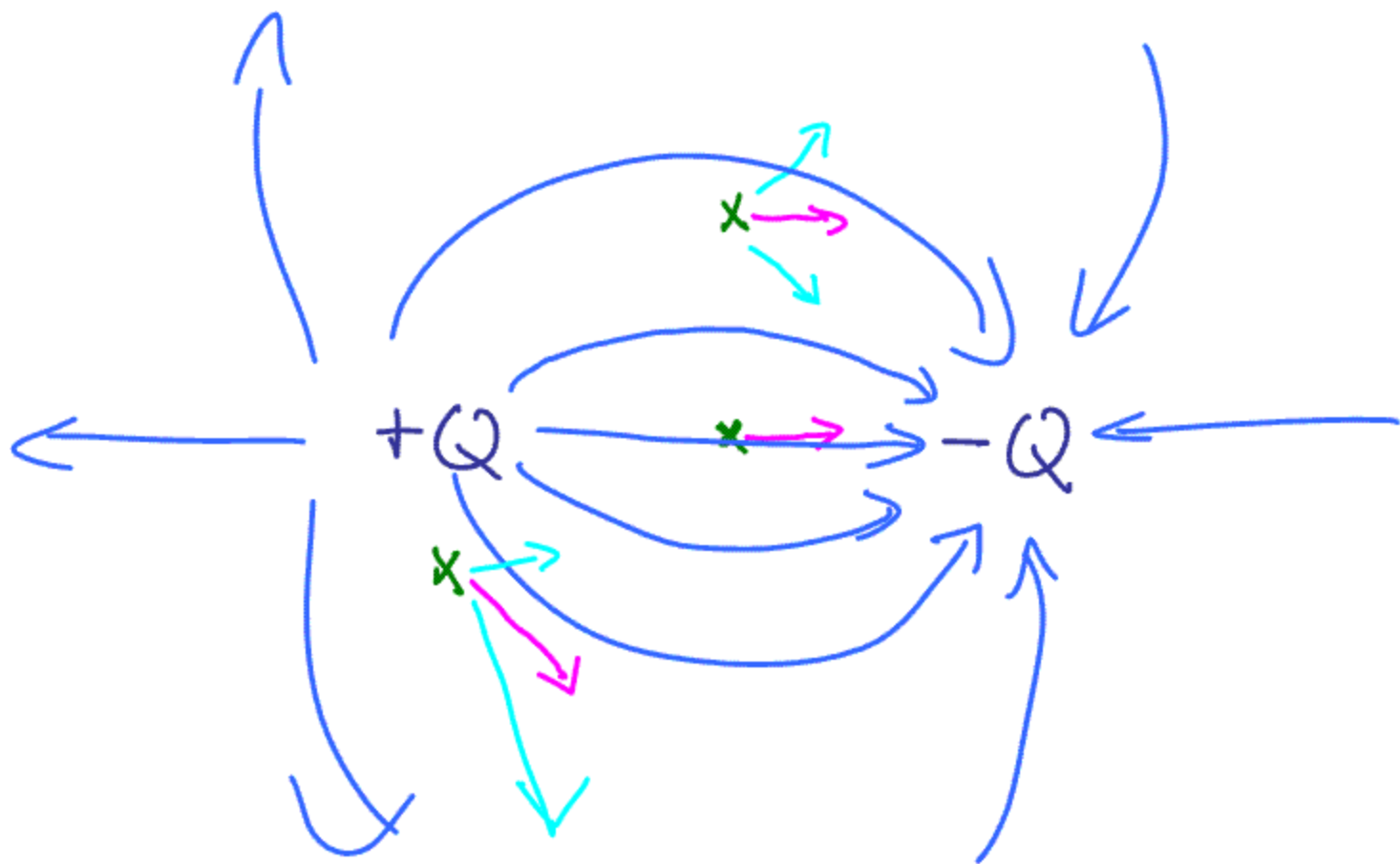
$$F = k \frac{Qq}{r^2}$$

$$\text{electric field} = \frac{F_{\text{on TEST charge}}}{q \text{ of TEST charge}}$$

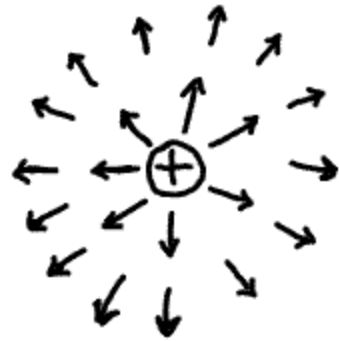


# Familiar "Fields"

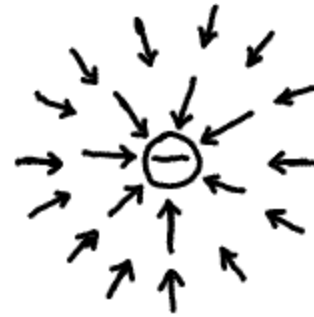




Finding electric field "lines"

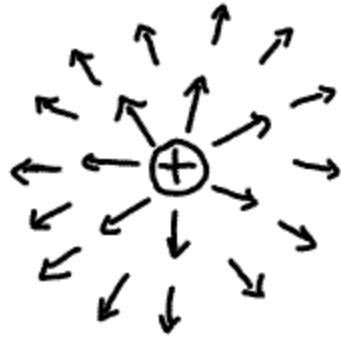


Electric field  
surrounding a  
positively charged  
particle

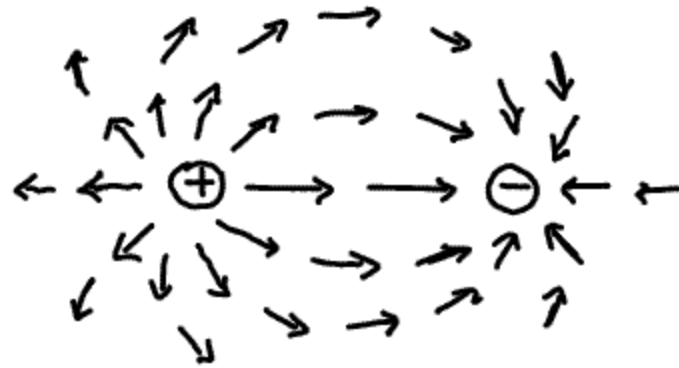


Electric field  
surrounding a  
negatively charged  
particle





Electric field  
around one  
charged particle



Electric field around two charges  
of opposite sign

Electric field around two  
charges of the same sign

