Physics 2140 Exam 1 Outline

Charges (Week 1)

- Like charges repel, opposite charges attract
- Charge is conserved
- Protons and electrons
- Neutral atoms and ions
- Charge quantization
- Charge carriers
- Coulomb's Law
- The size of coulombs
- Source and target charges
- $\vec{d}$ and $\hat{d}$
- Find the force on one charge due to multiple charges in 2D
- Dipoles

Electric Fields (Week 2)

- Electric fields
- Relationship between force and electric field
- WWPD (what would a proton do)
- Electric field of a point source charge
- Electric field of multiple source charges
- Electric field far from a dipole
- Electric field lines and their rules
  - Electric field is tangent to the field lines
  - Lines always have a direction
  - Emerge from positive charges, terminate at negative charges
  - Close to a point charge, they are radial
  - Lines never cross
  - Field lines show the total field of **all** source charges
  - denser field lines = stronger field
  - far away from a set of charges, field lines are radial depending on total charge, unless total charge is zero
- Field lines of a dipole
- Gauss' Law and Electric Flux
- Charge density: ρ, σ, λ
- Symmetry
- Electric field of charges with spherical symmetry: outside and inside
- Electric field of charges with ∞ cylindrical symmetry
- Conductors and insulators
- Polarization
- Electric field of a conductor
- Free charge in a conductor is only on the surface(s)
- Electric field of an infinite plane