PHY 202 Test 3 Preparation

Spring semester, 2004

The purpose of this assignment is to help you prepare for the Test 3. Fill in the appropriate laws or definitions; all variables must be defined somewhere in review sheet; draw a picture when appropriate (♣). Bring the completed assignment with you for use during the exam, and hand it in with your test: it will count as part of your test grade. Do not include any "extra" information on this assignment.

- Vector definitions
  - the gradient operator $\boldsymbol{\nabla} =$
  - Cross product (for combinations of $\hat{x}$, $\hat{y}$, and $\hat{z}$).
  - other right hand rule (unit normal to surface) ♣

    (This is the relation between the unit normal to a surface and direction of path on the boundary of that surface.)
  - electric or magnetic flux, $\Phi_{\mathbf{E}}$ or $\Phi_{\mathbf{B}}$ ♣

- Force of $\mathbf{E}$ and $\mathbf{B}$ fields on charged particles
  - Lorenz force law (definition of $\mathbf{E}$ and $\mathbf{B}$)
  - motion of particle in a circle (vector form) and centripetal acceleration
  - force on a wire ♣

– electric and magnetic dipole moments

	electric	magnetic
definition	♣	♣
torque		
energy		

- Relation between V and $\mathbf{E}$:
  - integral form ♣
  - derivative form
- Charge/current conservation
  - definition of current (give units) ♣
  - law in sentence form
  - law in terms of ρ and $\mathbf{J}$
- **Maxwell's equations** Include pictures showing any integration surfaces/volumes ♣. ty.
  - Gauß' law
  - Ampère's law (older version, for static fields)
  - Faraday's law for a coil of wire with N loops (older version)

- Superposition principle:

- Symmetries:
  - of $\mathbf{E}$ and V:
  - of $\mathbf{B}$:

- Charges produce electric fields
  - Coulomb's law (comes from Gauß' law) ♣

    rule for direction of $\mathbf{F}$:
  - Potential V of point charge (from Coulomb's law) ♣
  - $\mathbf{E}$ at the surface of a conductor
  - $\mathbf{E}$ in the interior of a conductor
- Currents produce magnetic fields
  - other-other right hand rule ♣

    (The direction of the $\mathbf{B}$ field from a wire.)
  - $\mathbf{B}$ field of straight wire ♣
  - $\mathbf{B}$ field of a tightly wound wire solenoid ♣
  - Biot-Savert law (comes from Ampère's law) ♣

- Circuits
  - definition of resistance (Ohm's law) ♣
  - definition of electric power
  - Kirchoff's 2 laws (note the associated conservation laws)
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    *
  - definition of capacitance ♣

    energy of a capacitor:
  - definition of (self) inductance ♣

    energy of an inductor: