Practice Problems for Final Review
Nov 29, 2018
Type corrected!

In addition to this page, I will include the "purple equation sheet" from Griffiths.

No phones or other device that connects to the internet.

You may use a calculator, though I don't think you'll need it.

Present clear and complete answers:

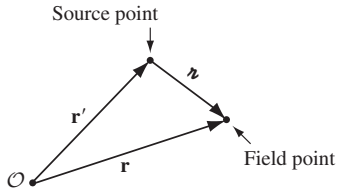
Explain your answers clearly but briefly. You want to aim for a level of solution that someone taking this class would be able to understand. A diagram and a few words may help.

Start calculations with first principles: things like definitions ($\vec{E} \equiv \frac{\vec{F}}{Q}$) or empirical laws (like Coulomb's Law or Newton's Laws) or conservation laws.

Check time:

The point values for each problem are shown next to the question number. Time yourself accordingly. The total value of the exam is 100 points. **Good luck!**

Some definitions:



Some more math:

$$\boldsymbol{\imath}^{\,2} = r^2 + r'^2 - 2rr'\cos\alpha$$

$$V_s = \frac{4}{3}\pi R^3$$

Helpful Equations:

$$\vec{F} = \frac{qQ}{4\pi\epsilon_0 \boldsymbol{\imath}^{\,2}}\hat{\boldsymbol{\imath}}$$

$$\oint \vec{E}\cdot d\vec{a} = \frac{q_{enc}}{\epsilon_0}$$

$$V(r) = -\int_{ref}^{r} \vec{E}\cdot d\vec{\ell}$$

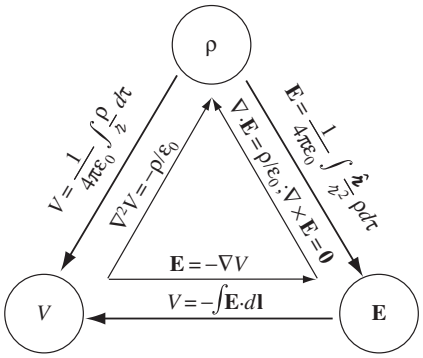


FIGURE 2.35

Helpful Taylor series expansions (for small ϵ):

$$e^{\epsilon} \approx 1 + \epsilon + \ldots$$

$$\ln(1+\epsilon) \approx \epsilon + \ldots$$

$$(1+\epsilon)^n \approx 1 + n\epsilon + \ldots$$

New Equations for the Final Exam:

$$\mathcal{E} = \oint \vec{E}\cdot d\vec{\ell} = -\frac{d\Phi_B}{dt}$$

$$\oint \vec{B}\cdot d\vec{\ell} = \mu_0 I_{enc} + \mu_0\epsilon_0 \int \frac{\partial \vec{E}}{\partial t}\cdot d\vec{a}$$

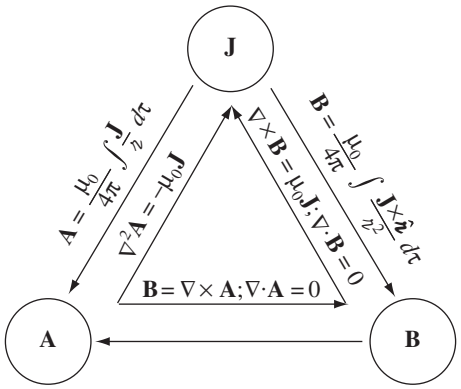


FIGURE 5.48

$$W = \frac{\epsilon_0}{2}\int E^2 d\tau$$

$$\vec{F} = Q\vec{E} + Q\vec{v}\times\vec{B} \qquad \vec{F} = \int I d\vec{\ell}\times\vec{B}$$

$$\vec{B}(\vec{r}) = \frac{\mu_0 I}{4\pi}\int \frac{d\vec{\ell}\times\hat{\boldsymbol{\imath}}}{\boldsymbol{\imath}^{\,2}} \qquad \oint \vec{B}\cdot d\vec{\ell} = \mu_0 I_{enc}$$