PHYS 340 Class Test 2, Nov. 14, 2014, 8:35-9:25

Examiner: S. Lovejoy

Write only in your exam booklet.
This is a closed book exam.
No calculators are permitted.
One double sided 8.5x11" sheet of notes is permitted.
This is an exam lasting 50 minutes.

Do all 3 problems and GOOD LUCK!

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1. Three charges are arranged in an "L" shaped right triangle. A charge $-2q$ is placed at the origin, and two charges, each of $+q$, are placed at $(0,l,0)$ and $(l,0,0)$, respectively.

a) Find a relatively simple expression for the potential $V(\underline{r})$ that is valid for distances $|\underline{r}| >> l$.

b) Make a rough plot of the equipotential surfaces in the x, y plane.

2. Find the bound surface charge density for the dielectric (with permittivity ε) for a parallel plate capacitor with charge Q and plate area A.

3. A thick spherical shell (inner radius a, outer radius b) is made of dielectric material with a "frozen in" polarization:

$$\underline{P}(\underline{r}) = \frac{k}{r}\hat{r}$$

where k is a constant and r is the distance from the centre. (There is no free charge in the problem).

Locate all the bound charge, and use Gauss's law to calculate the electric field it produces.