TEST ONE Thursday Evening 7:30- 9:00 pm March 3, 2005. The Friday class immediately following on March 5 2005 is canceled because of the evening exam.

What We Expect From You On The Exam

(1) Ability to calculate the electric field of both discrete and continuous charge distributions. We may give you a problem on setting up the integral for a continuous charge distribution, although we do not necessarily expect you to do the integral, unless it is particularly easy. You should be able to set up problems like: calculating the field of a small number of point charges, the field of the perpendicular bisector of a finite line of charge; the field on the axis of a ring of charge; and so on.

(2) To be able to recognize and draw the electric field line patterns for a small number of discrete charges, for example two point charges of the same sign, or two point charges of opposite sign, and so on.

(3) To be able to apply the principle of superposition to electrostatic problems.

(4) An understanding of how to calculate the electric potential of a discrete set of charges, that is the use of the equation $V(\mathbf{r}) = \sum_{i=1}^{N} \dfrac{q_i}{4\pi\varepsilon_o|\mathbf{r} - \mathbf{r}_i|}$ for the potential of N charges q_i located at positions $\mathbf{r}_i$. Also you must know how to calculate the configuration energy necessary to assemble this set of charges.

(5) The ability to calculate the electric potential given the electric field and the electric field given the electric potential, e.g. being able to apply the equations
$$\Delta V_{a\,to\,b} = V_b - V_a = -\int_a^b \mathbf{E}\cdot\mathbf{dl} \text{ and } \mathbf{E} = -\nabla V.$$

(6) An understanding of how to use Gauss's Law. In particular, we *may* give you a problem that involves either finding the electric field of a uniformly filled cylinder of charge, or of a slab of charge, or of a sphere of charge, and also the potential associated with that electric field. You must be able to explain the steps involved in this process clearly, and in particular to argue how to evaluate $\int \mathbf{E}\cdot d\mathbf{A}$ *on every part* of the closed surface to which you apply Gauss's Law, even those parts for which this integral is zero.

(7) An understanding of capacitors, including calculations of capacitance, and the effects of dielectrics on them.

(8) To be able to answer qualitative conceptual questions that require no calculation. There will be concept questions similar to those done in class, where you will be asked to make a qualitative choice out of a multiple set of choices, and to explain your choice qualitatively in words.