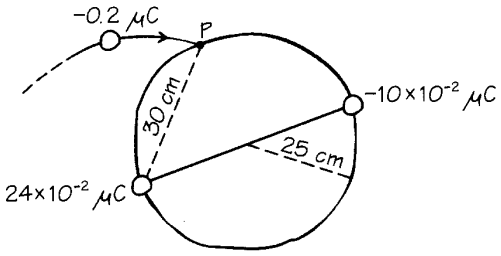
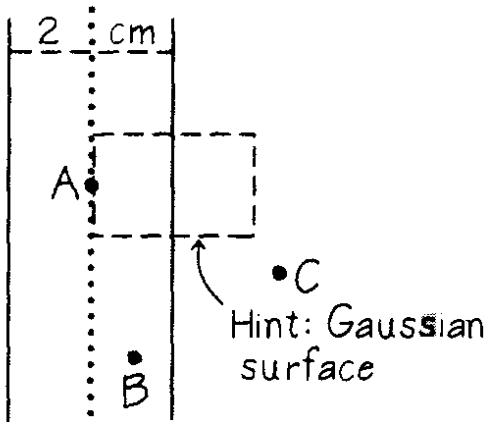
Problems Due Week Beginning Oct 4, 1999.

Prob2519: Consider two charges of 24 x 10^{-2} μC and -10 x 10^{-2} μC, respectively, at opposite ends of a diameter of a circle of radius 25 cm. (a) What is the potential on a point of the circle that is 30 cm from the positive charge? (b How much work is required to bring a charge of -0.2 μC from infinity to that point on the circle?



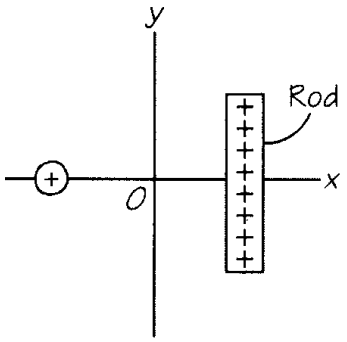
Hint: Figure out the distance from the negative charge to P first.

Prob2525: The figure below shows the cross section of a very large insulating slab that is uniformly charged to a charge density of 10^{-5} C/m3. The thickness of the slab is 2 cm.
(a) Determine the electric field of the charge on the slab at points A, B, and C.
(b) calculate the potential at points B and C, assuming that it is zero at A.
(c) Plot the electric field and the potential as a function of distance from the center of the slab.



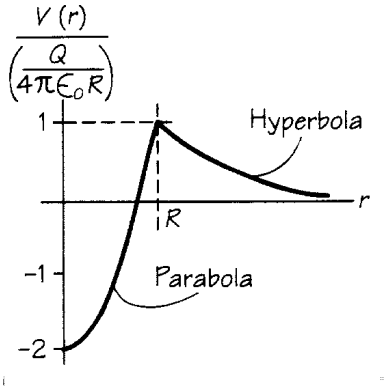
Hint: The Gaussian surface suggested could be a cylinder with axis perpendicular to the slab.

Prob2530. Sketch the equipotential surfaces for the charges shown in the figure below. Assume that the rod is an insulator.



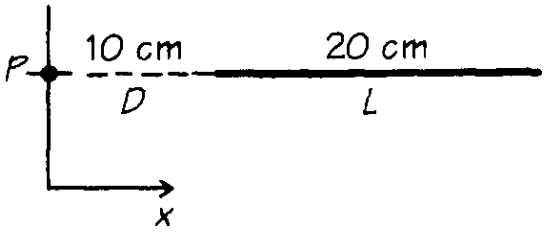
Hint: Use the rules discussed in class.

Prob2543. The potential V(r) of a spherically symmetric charge distribution is given by $V(r) = (Q/4\pi\varepsilon_o R)\,[-2 + 3(r/R)^2]$ for $r < R$ and $V(r) = Q/4\pi\varepsilon_o R$ for $r > R$. Calculate the electric field.



Hint: From symmetry electric field is radial and hence given V(r) we can find E(r).

Prob2551: A rod that is 20 cm long is given a uniformly distributed charge of 2 μC, see fig. Calculate the potential at a point P, which is a distance of 10 cm from the end of the rod, assuming that V = 0 at infinity.



Hint: Choose P as the origin and do the integral from D to D+L

Prob2561: Two spherical conductors of radii 20 mm and 100 mm are connected by a thin wire and carry charges ql and q2, respectively. If the wire is cut and the centers of the spheres are 250 mm apart, there is a repulsive force of 3.5 N between them. Use this information to calculate (a) q1and q2 and (b) the electric fields at the surfaces of the conductors when they are connected by the wire.

Hint: Conductors always have constant potential.

Prob2611: The capacitance of a variable capacitor used in a radio varies from 0.2 μF to 0.01 μF. The capacitor is charged to a potential difference of 300 V at maximum capacitance and then isolated. At minimum capacitance, what is the voltage!

Hint: Charge is conserved.