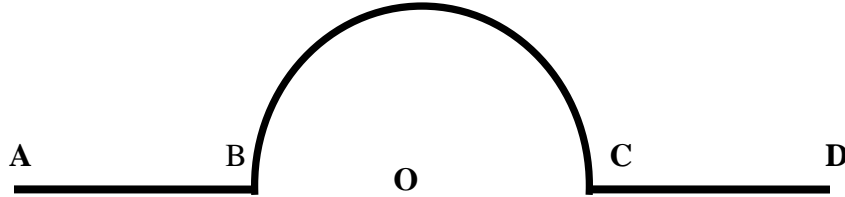Home Work II
Posted on 22nd Feb, Due on 1st March.

1). Prove that the electric field is always perpendicular to equal potential surface

2). A line (A-B-C-D) with uniform charge density λ is shown in the following figure. Calculate the electric field and the potential at center O, where AB=CD=Diameter of the semi-circle.

3).The time-average potential of a neutral hydrogen atom is given by

$$\phi = (\frac{q}{4\pi\varepsilon_0}\frac{e^{-\alpha r}}{r})(1+\frac{\alpha r}{2})$$

Where q is the magnitude of the electron charge, and $\alpha=2/a_0$, a_0 being bohr radius. Find the distribution of the charge(both continuous and discrete) that will give this potential and interpret your result physically.

4). Two long cylindrical conductors of radius a_1 and a_2 are parallel and separated by a distance d, which is large compared with either radius. Show that the capacitance per unit length is given approximately by $C \approx \pi\varepsilon_0(\ln\frac{d}{a})^{-1}$

Where a is the mean of two radii.

5). Calculate the force between conductor plates in a parallel plate capacitor (i) fixed the charge n each conductor (Q is a constant) (ii) fixed the potential difference between the plates.