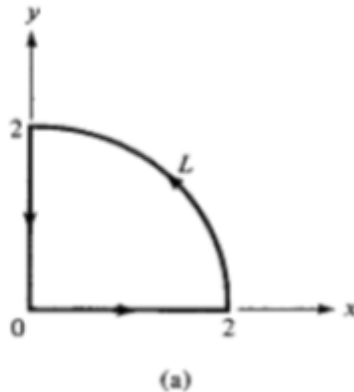


### TUTORIAL #3

QUES 1. Let  $\vec{A} = \rho \sin \theta \mathbf{a}_\rho + \rho^2 \mathbf{a}_\theta$ . Evaluate  $\oint_L \vec{A} \cdot d\mathbf{l}$  given that figure (a) using Stoke's theorem.



QUES 2. A Circular disk of radius  $a$  carries charge  $\rho_s = (1/\rho) \text{ C/m}^2$ . Calculate the potential at  $(0,0,h)$ .

Ques 3. Three concentric spherical shells  $r=1$ ,  $r=2$  and  $r=3\text{m}$  respectively have charge distributions 2, -4 and 5.

- a) Calculate the flux through  $r=1.5\text{m}$  and  $r=2.5\text{m}$
- b) Find  $\mathbf{D}$  at  $r=0.5$ ,  $r=2.5$  and  $r=3.5\text{m}$

Ques 4. Find the work done in carrying a 5C charge from P  $(1,2,-4)$  to R  $(3,-5,6)$  in an electric field

$$\vec{E} = a_x + z^2 a_y + 2yz a_z \text{ V/m.}$$

Ques 5. A point charge of 30nC is located at the origin while plane  $y=3$  carries charge  $10\text{nC/m}^2$ . Find  $\mathbf{D}$  at  $(0,4,3)$ .

Ques 6. Two point charges - 4  $\mu\text{C}$  and 5  $\text{j}\mu\text{C}$  are located at  $(2, -1, 3)$  and  $(0, 4, -2)$ , respectively. Find the potential at  $(1, 0, 1)$ .

Ques 7. A charge distribution with spherical symmetry has density

$$\begin{aligned} \rho_v &= \rho_0, 0 < r < R \\ \rho_v &= 0, r > R \end{aligned}$$

Determine  $V$  for region  $r < R$ .

Ques 8. In the above question determine the energy stored in the region  $r < R$ .

Ques 9. Determine the work necessary to transfer charges  $Q=1 \text{ mC}$  and  $Q_2 = -2 \text{ mC}$  from infinity to points  $(-2, 6, 1)$  and  $(3, -4, 0)$ , respectively.

Ques 10. An electric dipole with  $\mathbf{p} = p a_z \text{ C} \cdot \text{m}$  is placed at  $(x, z) = (0, 0)$ . If the potential at  $(0, 1)$  nm is 9 V, find the potential at  $(1, 1)$  nm.