

## Lab problems for 19/2/16

### Question.1

An infinite uniform linear charge  $\rho_l = 2.0 \text{ nC/m}$  lies along the  $x$  axis in free space, while point charges of  $8.0 \text{ nC}$  each are located at  $(0, 0, 1)$  and  $(0, 0, -1)$ . Find  $E$  at  $(2, 3, 4)$ . Write a MATLAB program to verify your answer.

### Question.2

The open surfaces  $\rho = 2.0 \text{ m}$  and  $\rho = 4.0 \text{ m}$ ,  $z = 3.0 \text{ m}$  and  $z = 5.0 \text{ m}$ , and  $\phi = 20^\circ$  and  $\phi = 60^\circ$  identify a closed surface. Find a) the enclosed volume, b) the total area of the enclosed surface. Write a MATLAB program to verify your answers.

### Question 3

Determine flux for the field  $\vec{A} = \rho^2 \cos^2 \phi \hat{a}_\rho + z \sin \phi \hat{a}_\phi$  over the closed surface of cylinder  $0 \leq z \leq 1, \rho = 4$ . Also verify divergence theorem.

### Question 4

What would be the work done to move a charge of  $1 \text{ C}$  around paths

a)  $(0,0)$  to  $(2,3)$

b)  $(2,3)$  to  $(1,1)$

c)  $(0,0)$  to  $(1,0)$  to  $(1,1)$  to  $(0,1)$  to  $(0,0)$

in presence of an electric field  $\vec{E} = 3\hat{a}_x$  ?