**Physics 102 (S15)**                                                                 **Q2B**

**Name:** _____  **Section:** _____  **Score:** _____/**20**

**1**. As shown in Figure 1 several point charges are fixed in space, making an electric field $\boldsymbol{E}$ in a plane. At the origin $O$ the electric field is given by $\boldsymbol{E} = (-3.2, 1.2) \times 10^3$ N/C.
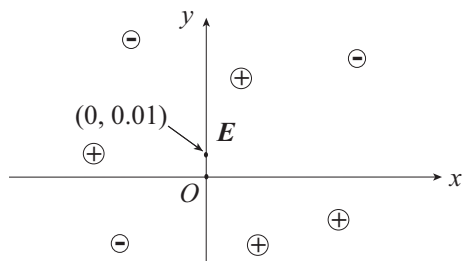


Figure 1:

(a) A charge $q = 1.5\ \mu$C is placed at the origin. What is the magnitude of the force acting on the charge? [5]

(b) Another charge which is exactly $-q$ is placed at $(0, 0.01)$ m and connected to the $+q$ charge to make a dipole. What is the magnitude of the torque on this dipole? [5]

**2**. Electric field lines due to more than 10 charges on a plane are depicted in Fig. 2.
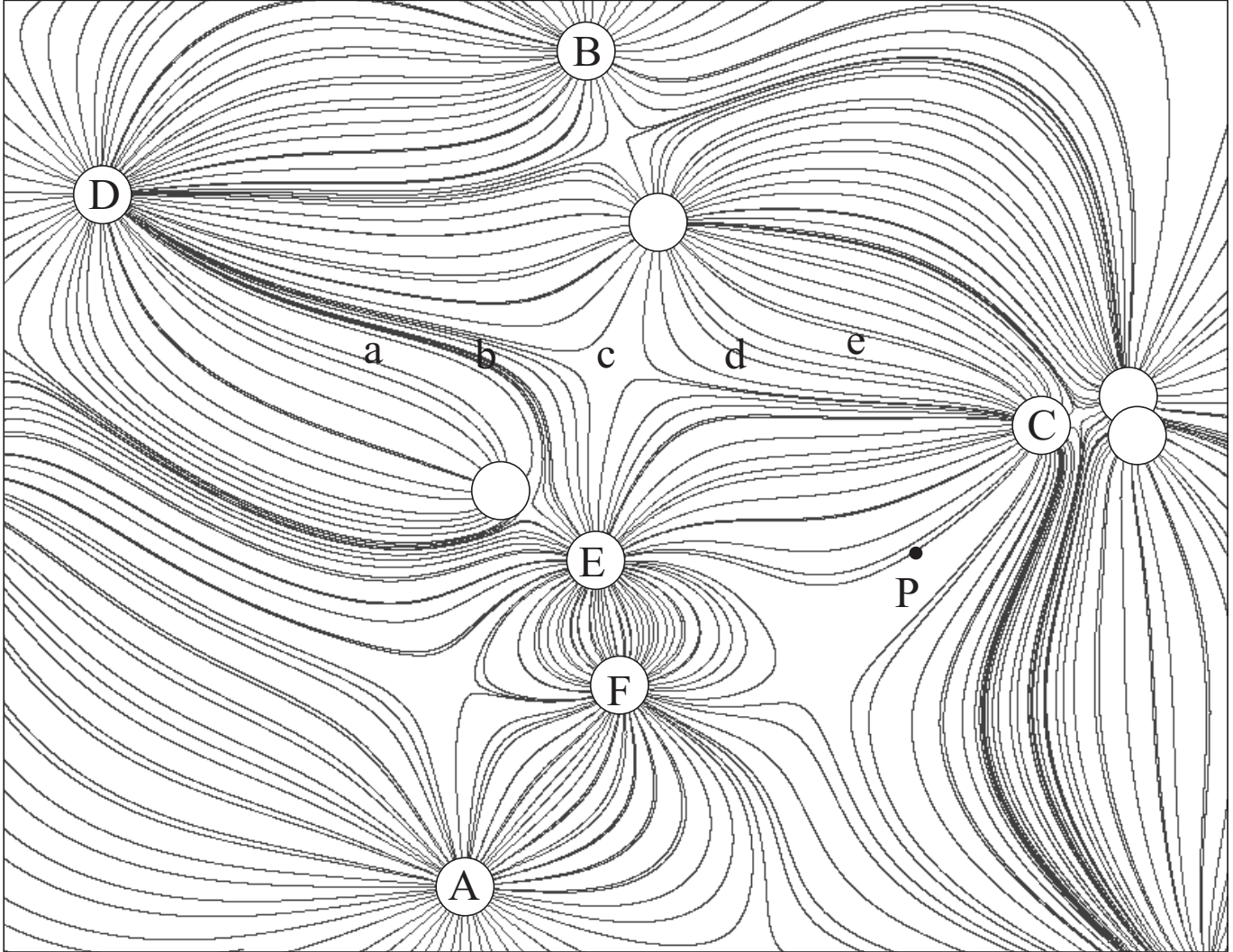


Figure 2:

(a) Suppose charge A is negative. Give all the negative charges among B-F. [4]

(b) Among the points a-e, where is the electric field zero? [2]

(c) Draw an arrow describing the direction of the electric field vector at P. [4]