Physics 102 (S15) **Q2A**

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 $\boldsymbol{E} = (2.3, -0.8) \times 10^3$ N/C.

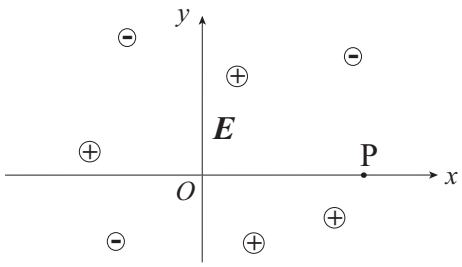

Figure 1:

(a) A charge $q = -1.3\ \mu$C is placed at the origin. What is the magnitude of the force acting on this charge q? [5]

|F| = |qE| = 1.3 x10{-6} x |E|.
Here, |E| = 2.435 x10^3 N/C, so |F| = 3.165 x 10{-3} = 3.2 mN.

(b) Now, the charge q in (a) is moved to location P whose coordinate vector is given by $(1.2, 0)$ m. What is the electric field at the origin due to all the charges? [5]

The filed created by q is only along the x-axis and its magnitude is
kq/r^2 = 9x10^9 x(1.3 x 10^{-6})/ 1.2^2 = 8.125 x 10^3 N/C
Since q < 0, as a vector this field is (+8.2, 0)x10^3, so total E = (10.5, -0.8) x 10^3 N/C.

2. Electric field lines due to 6 charges A - F (and other charges outside the figure window) on a plane are depicted in Fig. 2.

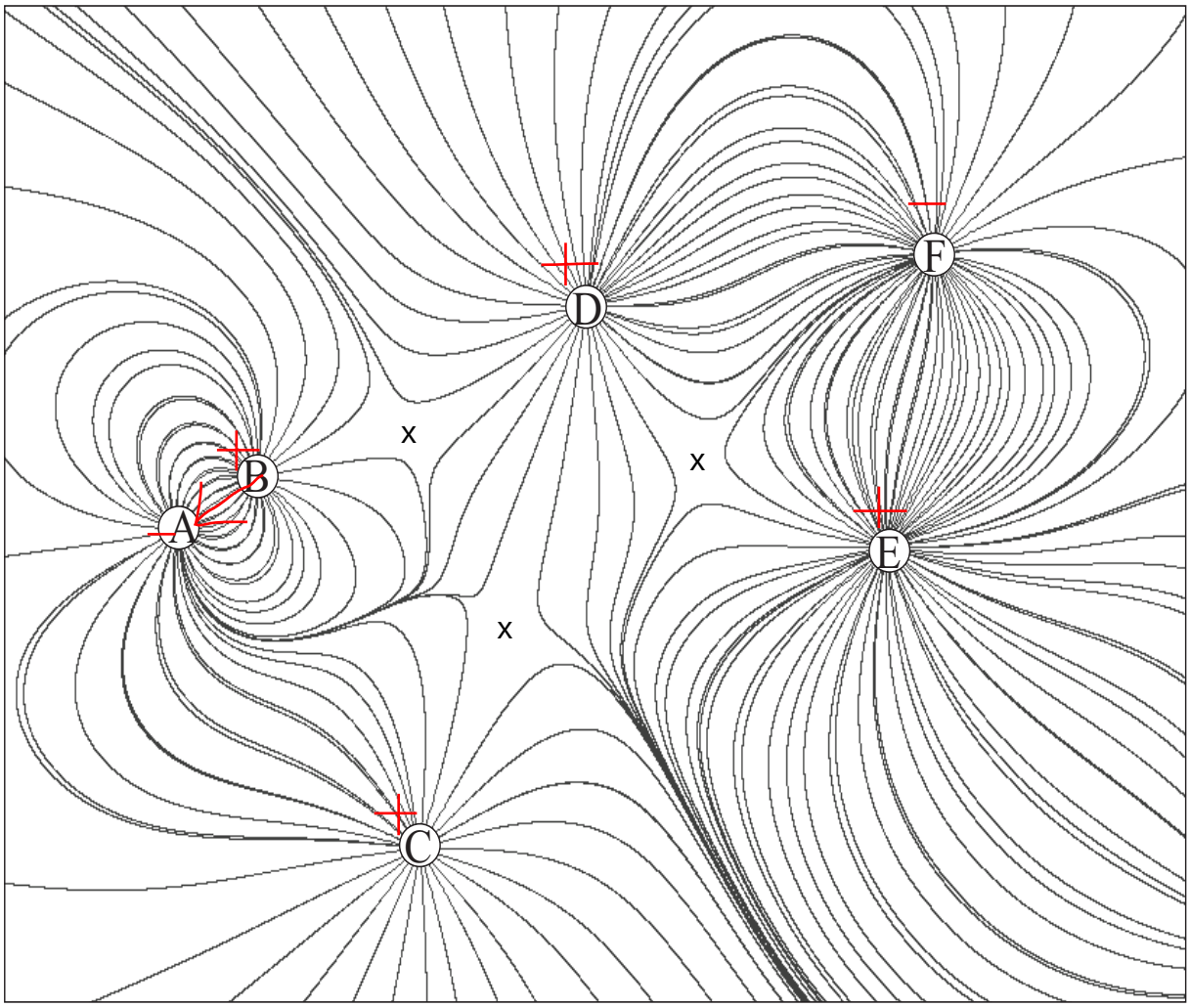

Figure 2:

(a) Suppose charge A is negative. Tell all the other negative charges. [4]

only F is negative.

(b) There are locations where the electric field is zero. Mark all suchpoints in the figure with X. [3]

(c) Suppose only charge B is allowed to move. Draw an arrow that indicates the intial direction of its motion. [3]