**Physics 102 (S15)** **Q3C**

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

**1**. As shown in Figure 1 there is a uniform electric field $\boldsymbol{E}$ around the origin due to a large unformly charged plane, which is perpendicular to the sheet of the quiz paper.

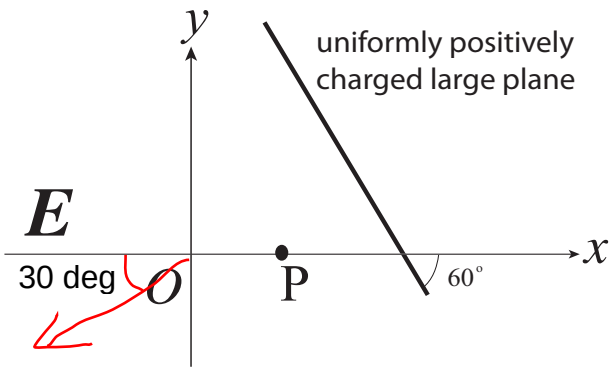


Figure 1:

(a) $|\boldsymbol{E}| = 5.0 \times 10^3$ N/C at the origin. We place a change $q = 2.0$ $\mu$C at the origin. Find the force (i.e., its $x$ and $y$ components). [5]

As a vector E = 5(-cos 30, - sin 30) x 10^3 = (-4.3 , -2) x 10^3 N/C
F = qE = (2 x 10^{-6}) x (-4.3, -2) x 10^3 = -(8.6, 4) x10^{-3} N.

(b) If this charge is moved to point P whose coordinate vector is $(0.02, 0)$ m. What is the total electric field at the origin? [5]

The field created by this charge at the origin is in the -x-direction, so
E = (- kq/r^2, 0) = -((9 x 10^9) x (2 x 10^{-6})/0.02^2, 0) = -(4.5 x 10^3. 0)
Thus, the total field - (8.8, 2) x10^3 N/C.

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

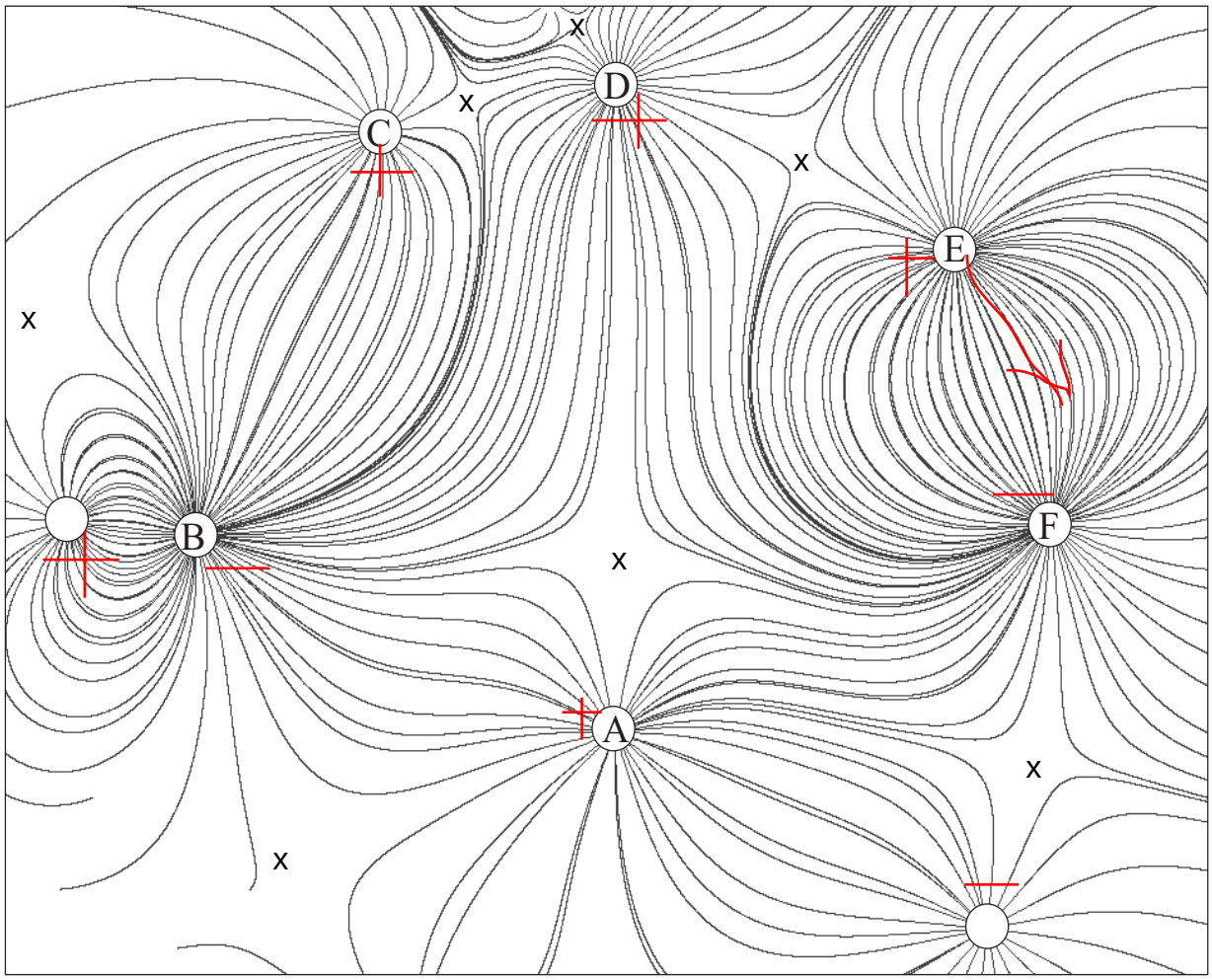


Figure 2:

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

B and F

(b) There are several points where the electric field vanishes. Mark any three of them with x. [4]

(c) If only the charge E is allowed to move, initially in which direction does it move? Draw an arrow indicating the direction in the figure at the initial location of charge E. [3]