Problems of the week I

1.

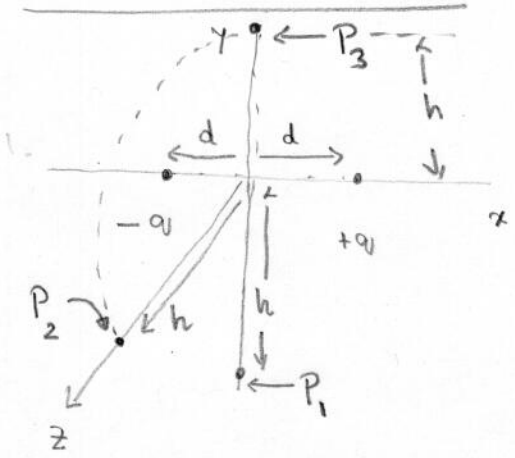


Fig. 1

Consider two point charges of magnitude $+q$ and $-q$ as shown in Fig 1.

(a) sketch the lines of force in the $x-y$ plane

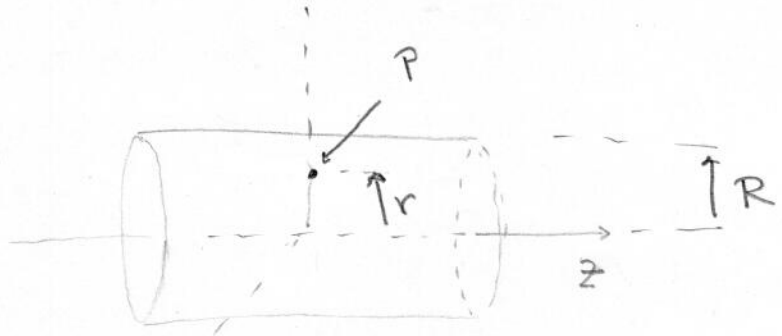
(b) what is the electric field at the origin?

(c) Assuming that these two charges are held fixed calculate the amount of work necessary to bring a test charge Q from very far away to the point P_1 shown in the figure?

(d) What is the answer to (c) if we change P_1 to P_2?

(e) Calculate the work necessary to move a test charge Q from P_2 to P_3.

2.



A cylinder of length L and radius R contaens uniform charge density ρ. Assuming L to be very large calculate the electric field at point P, at a distance r from the axis. Note that $r < R$, and $r > R$ will have two different expressions.

3. A sphere the size of a basketball is charged to a potential of -10^3 volts. About how many extra electrons are on it per cm^2 of surface?