MORE Test QUESTIONS – Exam 1

1. Show that the equation

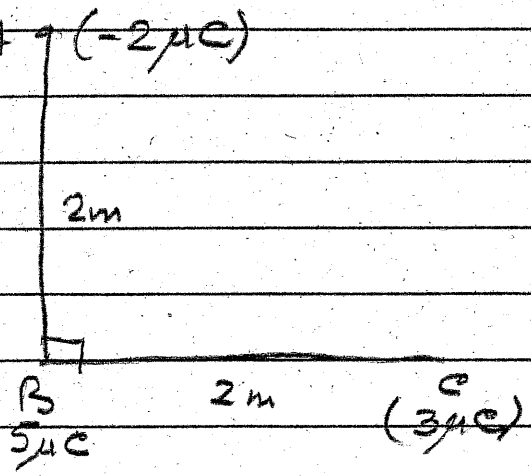
$$\vec{F}_E = \frac{k_e Q_1 Q_2}{r^2} \hat{r}$$

is consistent with Newton's 3rd Law of motion

2. A charge of $1\mu C$ is located at $x = 0$ and a charge of $-25\mu C$ is fixed at $x = 6$ m. Where would you place a charge of $-5\mu C$ so it experiences no force? Why?

3. How would your answer to problem 2 change if the third charge was $+5\mu C$? Why?

4. The picture shows three charges. What is the total force on the charge located at A?



5. A charge of +20 μC is sitting at r=0 and a particle of mass 0.1 kg is going around it on a circle of radius 0.5m at a speed of 100 m/s. What is the charge on the particle? Why?

6. How would you discover the presence of an $\underline{E}$-field?

7. Prob 3-12

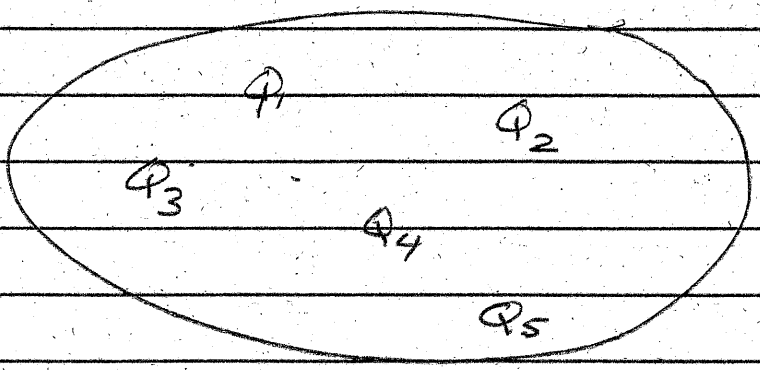
8. Prob 3-13

9.

10. Which $\underline{E}$ ~~field~~ is larger: $\underline{E}$ which is at a point 3m from a charge of 9μC or one at a point 1m from a charge of −1μC? Why?

11. State GAUSS' LAW IN your own words.

12 The picture shows a closed surface, the charges inside being $Q_1 = 1\mu C$, $Q_2 = 2\mu C$, $Q_3 = -3\mu C$, $Q_4 = 10\mu C$, $Q_5 = -10\mu C$.



What is the total flux of the $\vec{E}$-field through the closed surface? What can you say about the $\vec{E}$-field at any point on the surface? Justify your answers.

14 A charge Q is sitting at $x=0$. Show that the total flux of $\vec{E}$ through any closed surface surrounding it is $\frac{Q}{\epsilon_0}$.

15. The picture shows a hemisphere of radius 2m and the lines represent an $\vec{E}$ field of 100N/C inclined at 60° with respect to the y-axis (note $\hat{n} \parallel \hat{y}$). What is the flux of the $\vec{E}$-field through the closed top (dome) of the sphere.