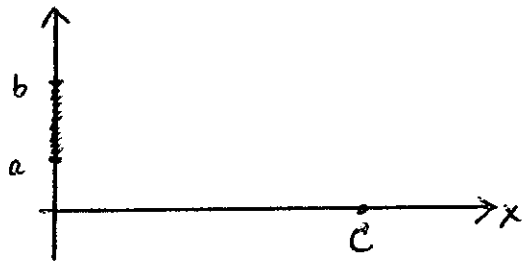
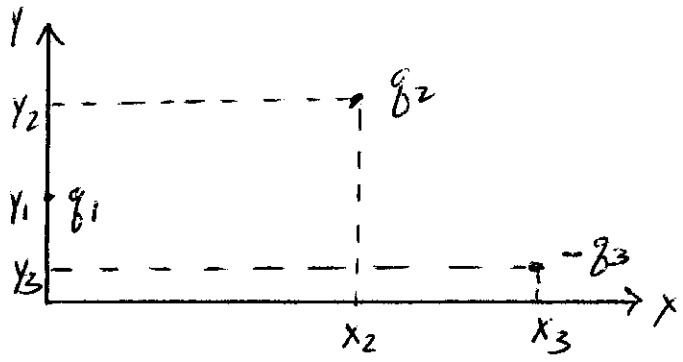
1. (25 points)A charge Q is uniformly spread along the y axis from $y = a$ to $y = b$. Find the electric field at the point $x = c, y = 0$.



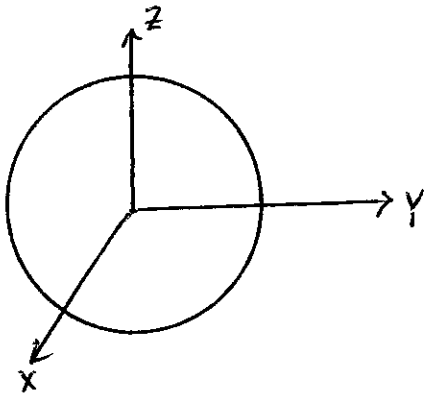
2. (25 points) Given the two positive charges, q_1 and q_2 and the negative charge $-q_3$, find the total electric force on the charge q_2.



3. (25 points)Given the $\vec{E}$ field

$$\vec{E} = \alpha r^3 \vec{i}_r$$

with α a known constant, and r the distance from the origin, how much charge is there in a sphere of radius A located with the center at the origin as shown?



4. (25 points) Suppose the Coulomb Force is not the one that really exists in nature but instead was given by

$$\vec{F} = \gamma \frac{q_1 q_2}{r^4} \hat{r}$$

where γ is a known constant. For this force find the electric potential function, V(x,y), for a charge Q located at the point $x = a, y = b$.