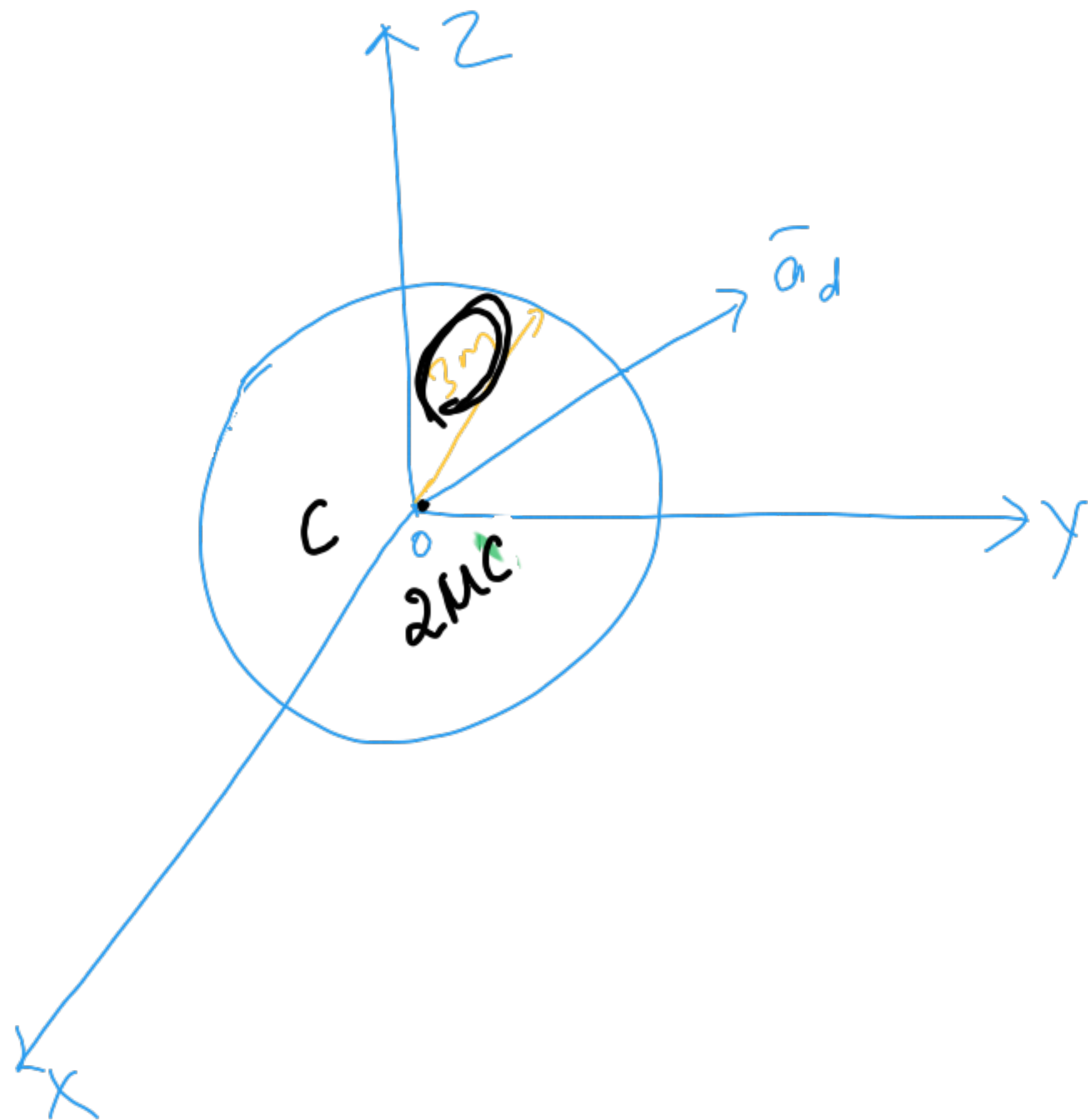


1) Calculate the field intensity at a point on a sphere of radius 3m, if a positive charge of 2μC is placed at the origin of the sphere.



Soln

$$r = 3\text{ m}$$

$$C = 2\mu\text{C}$$

$$\bar{E} = \frac{Q}{4\pi\epsilon_0 d^2} \bar{a}_d$$

$$\bar{E} = \frac{2 \times 10^{-6}}{4\pi \times 8.854 \times 10^{-12} (3)^2} \bar{a}_d$$

$$\bar{E} = 1997.271 \bar{a}_d \text{ V/m}$$

$$\int \sin \pi y \, dy = \left[-\frac{1}{\pi} (\cos \pi y) \right]$$

2) A Volume Charge density is expressed as $\rho_v = 10z^2 x \sin \pi y$. Find the total charge inside the volume $(-1 \leq x \leq 2)$ $(0 \leq y \leq 1)$ $(3 \leq z \leq 3.6)$

Soln

Given, $\rho_v = 10z^2 x \sin \pi y$

$$Q = \int_{vol} \rho_v dv = \int_{-1}^2 \int_0^1 \int_3^{3.6} 10z^2 x \sin \pi y dx dy dz$$

$$\left[-\frac{1}{\pi} \cos \pi y \right]_0^1 \left[-\frac{1}{\pi} \cos \pi + \frac{1}{\pi} \cos 0 \right]$$

$$= 10 \left[\frac{x^2}{2} \right]_{-1}^2 \left[\frac{z^3}{3} \right]_3^{3.6} \left[-\frac{\cos \pi y}{\pi} \right]_0^1$$

$$= 10 \left(\frac{4}{2} - \frac{1}{2} \right) \left[\frac{(3.6)^3}{3} - \frac{(3)^3}{3} \right]$$

$$\left[-\frac{\cos \pi}{\pi} + \frac{\cos 0}{\pi} \right]$$

$$= 62.57 \text{ C.}$$

