

Physics 102
Quiz # 5
Chapters 22&23

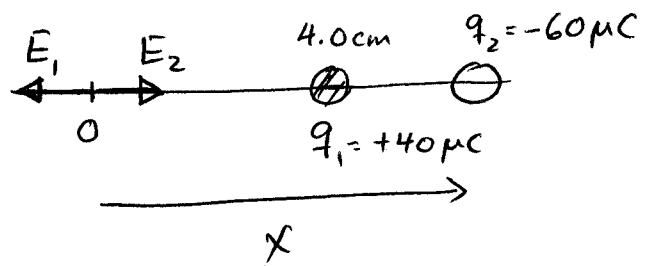
Name: Solution

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Sec. #:

A $40\text{-}\mu\text{C}$ charge is positioned on the x-axis at $x = 4.0\text{ cm}$. Where on this axis should a $(-60)\text{-}\mu\text{C}$ charge be placed to produce a net electric field of zero at the origin?

The electric field due to $q_1 = +40\text{ }\mu\text{C}$ is towards left. Since $q_2 = -60\text{ }\mu\text{C}$ is a negative charge, it should be placed at right side of q_1 ($|q_2| > |q_1|$)



Then

$$|\vec{E}_1| = |\vec{E}_2|$$

$$\frac{1}{4\pi\epsilon_0} \frac{|q_1|}{(4.0)^2} = \frac{1}{4\pi\epsilon_0} \frac{|q_2|}{x^2}$$

$$\Rightarrow x^2 = \frac{|q_2|}{|q_1|} (4.0)^2$$

$$\Rightarrow x = \sqrt{\frac{|q_2|}{|q_1|}} \cdot 4.0\text{ cm}$$

$$\Rightarrow x = \sqrt{\frac{60 \times 10^{-6}}{40 \times 10^{-6}}} \times 4.0\text{ cm}$$

$$\Rightarrow \boxed{x = +4.9\text{ cm}}$$