

### Answer on Question #67117, Physics / Electromagnetism

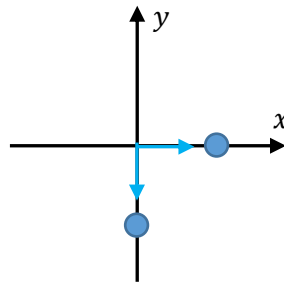
$$\vec{E} = 60 \vec{e}_x - 45 \vec{e}_y \left[ \frac{V}{m} \right]$$

$$|\vec{E}| = 75 \left[ \frac{V}{m} \right]$$

#### Question

A  $-15 \text{ nC}$  point charged is placed on the x-axis at  $x = 1.5 \text{ m}$  and a  $-20 \text{ nC}$  charge is placed on the y-axis at  $y = -2.0 \text{ m}$ . What is the magnitude of the electric field at the origin?

#### Solution



Blue circles represents charges, arrows – partial electric fields.

1<sup>st</sup> charge:

$$q_1 = -15 \text{ nC}, \quad x_1 = 1.5 \text{ m}, \quad y_1 = 0 \text{ m}$$

$$\vec{E}_1 = k \frac{q}{r^3} \vec{r} = -\frac{kq_1}{x_1^2} \vec{e}_x \approx \frac{9 \cdot 10^9 \cdot 15 \cdot 10^{-9}}{1.5^2} \vec{e}_x = 60 \vec{e}_x \left[ \frac{V}{m} \right]$$

2<sup>st</sup> charge:

$$q_2 = -20 \text{ nC}, \quad x_2 = 0 \text{ m}, \quad y_2 = -2.0 \text{ m}$$

$$\vec{E}_2 = k \frac{q}{r^3} \vec{r} = \frac{kq_2}{y_2^2} \vec{e}_y \approx -\frac{9 \cdot 10^9 \cdot 20 \cdot 10^{-9}}{2^2} \vec{e}_y = -45 \vec{e}_y \left[ \frac{V}{m} \right]$$

Total electric field at the origin:

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

$$\vec{E} = 60 \vec{e}_x - 45 \vec{e}_y \left[ \frac{V}{m} \right]$$

$$|\vec{E}| = \sqrt{60^2 + (-45)^2} = 75 \left[ \frac{V}{m} \right]$$

Answer provided by <https://www.AssignmentExpert.com>