

Actividad: Problema Coulomb

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Resolución del Problema

Actividad Coulomb:
Encontrar fuerza neta:

$q_1 = q, (3, 4)$
 $q_2 = 3q, (0, 0)$
 $q_3 = -2q, (0, 3)$
 $q_4 = q, (1, 4)$

$\vec{F}_{\text{neta}} = \vec{F}_{21} + \vec{F}_{31} + \vec{F}_{41}$
 Entonces, cada fuerza individual:

$\vec{F}_{21} = k \left(\frac{q \cdot 3q}{5^3} \right) (3, 4) = k \left(\frac{3q^2}{125} \right) (3, 4)$
 $\vec{r}_2 = (3, 4)$
 $r_2 = \sqrt{3^2 + 4^2}$
 $r_2 = 5$
 $\vec{F}_{31} = k \left(\frac{-2q \cdot q}{r_3^3} \right) (\vec{r}_3) = k \left(\frac{-2q^2}{4^3} \right) (0, 4)$
 $\vec{r}_3 = (3, 4) - (3, 0) = (0, 4)$
 $r_3 = 4$
 $\vec{F}_{31} = k \left(\frac{-2q^2}{64} \right) (0, 4) = -k \left(\frac{2q^2}{64} \right) (0, 4)$
 $\vec{F}_{41} = k \left(\frac{q^2}{r_4^3} \right) (\vec{r}_4) = k \left(\frac{q^2}{8} \right) (2, 0)$
 $\vec{r}_4 = q_1 - q_4 = (3, 4) - (1, 4) = (2, 0)$
 $r_4 = 2$

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Figura 1: Primera página de solución

$$\begin{aligned}
 \vec{F}_{\text{net}a} &= \vec{F}_{21} + \vec{F}_{31} + \vec{F}_{41} \\
 \vec{F}_{\text{net}a} &= k \left(\frac{3q^2}{125} \right) (3, 4) + \text{Sustituyendo} - k \left(\frac{2q^2}{64} \right) (0, 4) \\
 &\quad + k \left(\frac{q^2}{8} \right) (2, 0) \\
 &= kq^2 \left(\frac{1}{125} (3, 4) - \frac{2}{64} (0, 4) + \frac{1}{8} (2, 0) \right) \\
 \vec{F}_{21} &= k \left(\frac{3q^2}{125} \right) (3, 4) \\
 \vec{F}_{21} &= \frac{9q^2k}{125} \hat{x} + \frac{12q^2k}{125} \hat{y} \\
 \vec{F}_{31} &= k \left(\frac{-2q^2}{64} \right) (0, 4) \\
 \vec{F}_{31} &= 0 \hat{x} - \frac{8q^2k}{64} \hat{y} = -\frac{q^2k}{8} \hat{y} \\
 \vec{F}_{41} &= \frac{2q^2k}{8} \hat{x} + 0 \hat{y} = \frac{q^2k}{4} \hat{x} \\
 \vec{F}_{\text{net}a} &= \frac{9q^2k}{125} \hat{x} + \frac{12q^2k}{125} \hat{y} - \frac{q^2k}{8} \hat{y} + \frac{q^2k}{4} \hat{x} \\
 \vec{F}_{\text{net}a} &= \frac{9q^2k}{125} \hat{x} + \frac{q^2k}{4} \hat{x} + \frac{12q^2k}{125} \hat{y} - \frac{q^2k}{8} \hat{y} \\
 \vec{F}_{\text{net}a} &= kq^2 \left[\left(\frac{9}{125} + \frac{1}{4} \right) \hat{x} + \left(\frac{12}{125} - \frac{1}{8} \right) \hat{y} \right] \\
 \vec{F}_{\text{net}a} &= \frac{q^2}{4\pi\epsilon_0} \left(\frac{161}{500} \hat{x} + \frac{29}{600} \hat{y} \right) /
 \end{aligned}$$

Figura 2