



(a) Trobar \vec{E} en el punt (4,0)

Primer trobarem el camp creat per la càrrega q_1 :

$$\vec{r}_1 = 4\hat{i} - 3\hat{j}$$

$$|\vec{r}_1| = \sqrt{4^2 + 3^2} = 5 \text{ m.}$$

$$\hat{r}_1 = \frac{\vec{r}_1}{|\vec{r}_1|} = \frac{4}{5}\hat{i} - \frac{3}{5}\hat{j}$$

$$\vec{E}_1 = k \frac{q_1}{r_1^2} \hat{r}_1 = 9 \times 10^9 \cdot \frac{3 \times 10^{-6}}{25} \cdot \left(\frac{4}{5}\hat{i} - \frac{3}{5}\hat{j} \right)$$

$$\vec{E}_1 = (864\hat{i} - 648\hat{j}) \text{ N/C.}$$

$$\vec{E}_2 = k \frac{q_2}{r_2^2} \hat{r}_2$$

$$\text{on: } \vec{r}_2 = 4\hat{i} + 5\hat{j} \quad / \quad |\vec{r}_2| = \sqrt{4^2 + 5^2} = \sqrt{41} = 6,4 \quad / \quad \hat{r}_2 = \frac{\vec{r}_2}{|\vec{r}_2|} = 0,625\hat{i} + 0,78\hat{j}$$

$$\vec{E}_2 = 9 \times 10^9 \cdot \frac{(-7 \times 10^{-6})}{41} (0,625\hat{i} + 0,78\hat{j}) = (-960,4\hat{i} - 1198,5\hat{j}) \text{ N/C}$$

$$\vec{E} = \vec{E}_1 + \vec{E}_2 = (864\hat{i} - 648\hat{j}) + (-960,4\hat{i} - 1198,5\hat{j}) = (-96,4\hat{i} - 1846,5\hat{j}) \text{ N/C}$$

(b) $V(0) - V(P)$

$$V(0) = k \frac{q_1}{r_{10}} + k \frac{q_2}{r_{20}} = 9 \times 10^9 \cdot \frac{3 \times 10^{-6}}{3} + 9 \times 10^9 \cdot \frac{(-7 \times 10^{-6})}{5} = -3600 \text{ V}$$

$$V(P) = k \frac{q_1}{r_{1P}} + k \frac{q_2}{r_{2P}} = 9 \times 10^9 \cdot \frac{3 \times 10^{-6}}{\sqrt{3^2 + 4^2}} + 9 \times 10^9 \cdot \frac{(-7 \times 10^{-6})}{\sqrt{4^2 + 5^2}} = 1080 - 9839 = -8759 \text{ V}$$

$$V(0) - V(P) = -3600 - (-8759) = \boxed{5159 \text{ V}}$$

$$W = q[V(P) - V(0)] = 5 \times 10^{-6} \cdot (-5159 \text{ V}) = \boxed{-0,026 \text{ J}}$$