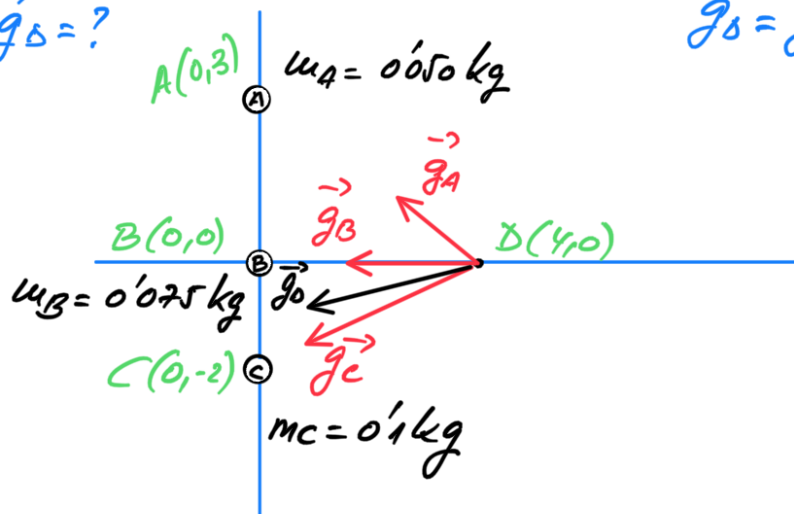


EXERCICIO F2BE2503:

a) $\vec{g}_D = ?$

$$\vec{g}_D = \vec{g}_A + \vec{g}_B + \vec{g}_C = \dots$$



$$\vec{g}_A = -G \frac{m_A}{r_A^2} \frac{\vec{r}_A}{r_A} ; \quad \vec{r}_A = 4\vec{i} - 3\vec{j} \\ |\vec{r}_A| = \sqrt{25} = 5 \text{ m}$$

$$\vec{g}_A = -6,67 \cdot 10^{-11} \frac{0,05}{5^2} \frac{4\vec{i} - 3\vec{j}}{5} = -1,07 \cdot 10^{-13} \vec{i} + 8,0 \cdot 10^{-14} \vec{j} \left(\frac{\text{N}}{\text{kg}} \right)$$

$$\vec{g}_B = -G \frac{m_B}{r_B^2} \frac{\vec{r}_B}{r_B} ; \quad \vec{r}_B = 4\vec{i} ; \quad |\vec{r}_B| = r_B = 4 \text{ m}$$

$$\vec{g}_B = -6,67 \cdot 10^{-11} \frac{0,075}{4^2} \frac{4\vec{i}}{4} = -3,13 \cdot 10^{-13} \vec{i} \left(\frac{\text{N}}{\text{kg}} \right)$$

$$\vec{g}_C = -G \frac{m_C}{r_C^2} \frac{\vec{r}_C}{r_C} ; \quad \vec{r}_C = 4\vec{i} + 2\vec{j} ; \quad r_C = \sqrt{20} \text{ m}$$

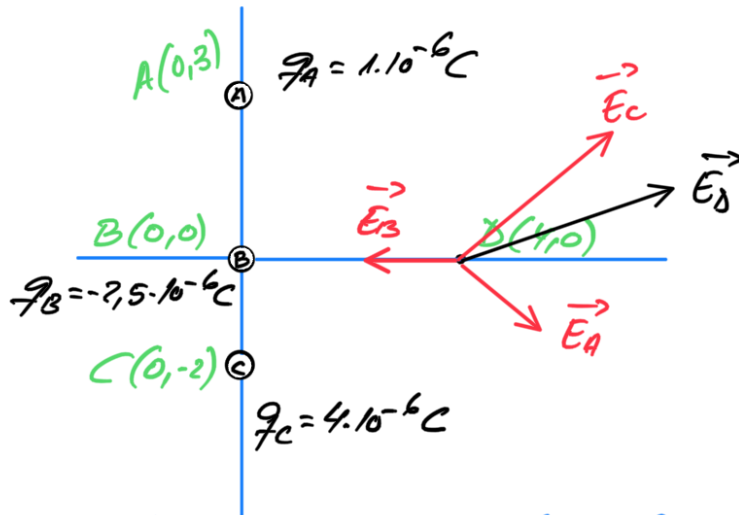
$$\vec{g}_C = -6,67 \cdot 10^{-11} \frac{0,1}{(\sqrt{20})^2} \frac{4\vec{i} + 2\vec{j}}{\sqrt{20}} = -2,98 \cdot 10^{-13} \vec{i} - 1,49 \cdot 10^{-13} \vec{j} \left(\frac{\text{N}}{\text{kg}} \right)$$

SOMA:

$$\dots = \vec{g}_D = \vec{g}_A + \vec{g}_B + \vec{g}_C = -7,18 \cdot 10^{-13} \vec{i} - 6,9 \cdot 10^{-14} \vec{j} \left(\frac{\text{N}}{\text{kg}} \right)$$

$$|\vec{g}_D| = 7,21 \cdot 10^{-13} \frac{\text{N}}{\text{kg}}$$

$$b) \vec{E}_D = \vec{E}_A + \vec{E}_B + \vec{E}_C = \dots$$



$$\vec{E}_A = k \frac{q_A}{r_A^2} \cdot \frac{\vec{r}_A}{r_A} = 9 \cdot 10^9 \frac{1 \cdot 10^{-6}}{5^2} \frac{4\vec{i} - 3\vec{j}}{5} = 288\vec{i} - 216\vec{j} \left(\frac{N}{C}\right)$$

$$\vec{E}_B = k \frac{q_B}{r_B^2} \frac{\vec{r}_B}{r_B} = 9 \cdot 10^9 \frac{-2.5 \cdot 10^{-6}}{4^2} \frac{4\vec{i}}{4} = -1406.25\vec{i} \left(\frac{N}{C}\right)$$

$$\vec{E}_C = k \frac{q_C}{r_C^2} \frac{\vec{r}_C}{r_C} = 9 \cdot 10^9 \frac{4 \cdot 10^{-6}}{(\sqrt{20})^2} \frac{4\vec{i} + 2\vec{j}}{\sqrt{20}} = 1609.97\vec{i} + 804.98\vec{j} \left(\frac{N}{C}\right)$$

SUMA

$$\vec{E}_D = \vec{E}_A + \vec{E}_B + \vec{E}_C = 491.72\vec{i} + 588.98\vec{j} \left(\frac{N}{C}\right)$$

$$|\vec{E}_D| = 767.26 \frac{N}{C}$$

c) aceleració: $\vec{F} = m_e \cdot \vec{a} \Rightarrow \vec{a} = \frac{\vec{F}}{m_e}$
 $\vec{F} = \vec{F}_g + \vec{F}_E$;

$$\vec{F}_g = m_e \cdot \vec{g}_D = 9.1 \cdot 10^{-31} \cdot (-7.18 \cdot 10^{-13}\vec{i} - 6.9 \cdot 10^{-14}\vec{j}) =$$

$$\vec{F}_g = -6.53 \cdot 10^{-43}\vec{i} - 6.28 \cdot 10^{-44}\vec{j} \text{ (N)}$$

$$\vec{F}_E = q_e \cdot \vec{E}_D = -1.6 \cdot 10^{-19} (491.72\vec{i} + 588.98\vec{j}) =$$

$$\vec{F}_E = -7.87 \cdot 10^{-17}\vec{i} - 9.42 \cdot 10^{-17}\vec{j} \text{ (N)}$$

$$\vec{F} = \vec{F}_g + \vec{F}_E = -7,87 \cdot 10^{-17} \vec{i} - 9,42 \cdot 10^{-17} \vec{j} \text{ (N)}$$

$$\vec{a} = \frac{\vec{F}}{m_e} = \frac{-7,87 \cdot 10^{-17} \vec{i} - 9,42 \cdot 10^{-17} \vec{j}}{9,1 \cdot 10^{-31}}$$

$$\vec{a} = -8,65 \cdot 10^{13} \vec{i} - 1,04 \cdot 10^{14} \vec{j} \frac{\text{m}}{\text{s}^2}$$

$$|\vec{a}| = 1,35 \cdot 10^{14} \frac{\text{m}}{\text{s}^2}$$

$$d) W_{\text{campo}}[(4,0) \rightarrow \infty] = -\Delta E_p = -q_e (V_{\infty} - V(4,0))$$

$$\begin{aligned} V(4,3) &= V_A + V_B + V_C = k \frac{q_A}{r_A} + k \frac{q_B}{r_B} + k \frac{q_C}{r_C} = \\ &= 9 \cdot 10^9 \frac{1 \cdot 10^{-6}}{5} + 9 \cdot 10^9 \frac{-2,5 \cdot 10^{-6}}{4} + 9 \cdot 10^9 \frac{4 \cdot 10^{-6}}{\sqrt{20}} = \\ &= 1800 - 5625 + 8049,84 = 4224,84 \text{ V} \end{aligned}$$

$$\begin{aligned} W_{\text{campo}} &= -q_e (0 - 4224,84) = \\ &= -(-1,6 \cdot 10^{-19}) \cdot (-4224,84) = \end{aligned}$$

$$W_{\text{campo}} = -6,76 \cdot 10^{-16} \text{ J}$$

"No lo realiza el campo"