

EXERCÍCIO FQ1BE3401:

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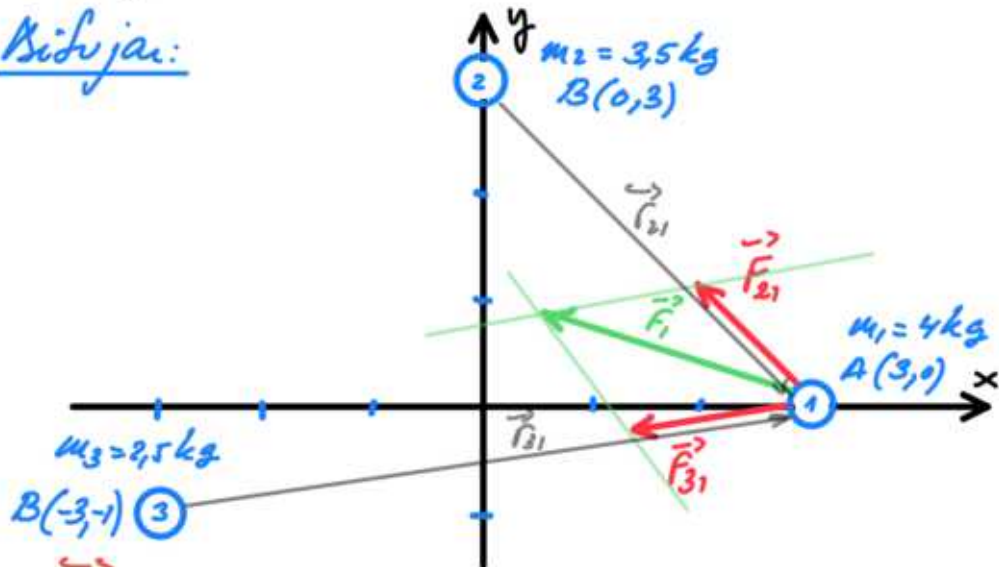
$$m_1 = 4 \text{ kg em } A(3,0)$$

$$m_2 = 3,5 \text{ kg em } B(0,3)$$

$$m_3 = 2,5 \text{ kg em } C(-3,-1)$$

$$G = 6,67 \cdot 10^{-11} \text{ u.s.s.}$$

a) Diagrama:



b) $\vec{F}_{21} = ?$ y $F_{21} = ?$

$$\vec{F}_{21} = -G \frac{m_2 m_1}{r_{21}^2} \frac{\vec{r}_{21}}{r_{21}} = \dots = -6,67 \cdot 10^{-11} \frac{3,5 \cdot 4}{18} \frac{3\vec{i} - 3\vec{j}}{\sqrt{18}} =$$

$$\vec{r}_{21} = 3\vec{i} - 3\vec{j} \Rightarrow |\vec{r}_{21}| = \sqrt{3^2 + (-3)^2} = \sqrt{18} \text{ m}$$

$$= \boxed{\vec{F}_{21} = -3,67 \cdot 10^{-11} \vec{i} + 3,67 \cdot 10^{-11} \vec{j} \text{ (N)}}$$

$$|\vec{F}_{21}| = \sqrt{(-3,67 \cdot 10^{-11})^2 + (3,67 \cdot 10^{-11})^2} = \boxed{5,19 \cdot 10^{-11} \text{ N} = F_{21}}$$

c) $\vec{F}_{31} = ?$ y $F_{31} = ?$

$$\vec{F}_{31} = -G \frac{m_3 m_1}{r_{31}^2} \frac{\vec{r}_{31}}{r_{31}} = \dots = -6,67 \cdot 10^{-11} \frac{2,5 \cdot 4}{37} \frac{6\vec{i} + \vec{j}}{\sqrt{37}} =$$

$$\vec{r}_{31} = 6\vec{i} + \vec{j} \Rightarrow |\vec{r}_{31}| = \sqrt{6^2 + 1^2} = \sqrt{37}$$

$$= \boxed{\vec{F}_{31} = -1,78 \cdot 10^{-11} \vec{i} - 2,96 \cdot 10^{-12} \vec{j} \text{ (N)}}$$

$$|\vec{F}_{31}| = \sqrt{(-1,78 \cdot 10^{-11})^2 + (-2,96 \cdot 10^{-12})^2} = \boxed{1,80 \cdot 10^{-11} \text{ N} = F_{31}}$$

d) $\vec{F}_1 = ?$ y $|\vec{F}_1| = ?$

$$\vec{F}_1 = \vec{F}_{21} + \vec{F}_{31}$$

$$\vec{F}_{21} = -3,67 \cdot 10^{-11} \vec{i} + 3,67 \cdot 10^{-11} \vec{j} \text{ (N)}$$

+

$$\vec{F}_{31} = -1,78 \cdot 10^{-11} \vec{i} - 2,96 \cdot 10^{-12} \vec{j} \text{ (N)}$$

$$= \vec{F}_1 = -5,45 \cdot 10^{-11} \vec{i} + 3,37 \cdot 10^{-11} \vec{j} \text{ (N)}$$

$$|\vec{F}_1| = \sqrt{(-5,45 \cdot 10^{-11})^2 + (3,37 \cdot 10^{-11})^2} =$$

$$|\vec{F}_1| = 6,41 \cdot 10^{-11} \text{ N}$$

e) Acceleración y módulo: sobre m_1

$$\vec{F} = m_1 \cdot \vec{a}_1 \Rightarrow \vec{a}_1 = \frac{\vec{F}_1}{m_1} = \frac{-5,45 \cdot 10^{-11} \vec{i} + 3,37 \cdot 10^{-11} \vec{j}}{4} =$$

$$\vec{a}_1 = -1,36 \cdot 10^{-11} \vec{i} + 8,43 \cdot 10^{-12} \vec{j} \text{ (m/s}^2\text{)}$$

$$|\vec{a}_1| = \sqrt{(-1,36 \cdot 10^{-11})^2 + (8,43 \cdot 10^{-12})^2} = 1,60 \cdot 10^{-11} \text{ m/s}^2$$

También:

$$|\vec{a}_1| = \frac{|\vec{F}_1|}{m_1} = \frac{6,41 \cdot 10^{-11}}{4} = 1,60 \cdot 10^{-11} \text{ m/s}^2$$

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