

Physics 101-Rec
Quiz # 8

Instructor: Dr. Mekki

Name: _____

Key

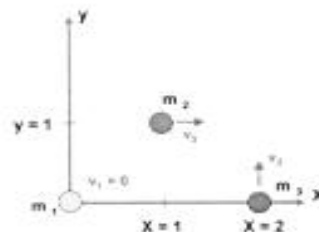
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Sect.#: _____

- (a) If all the masses in the figure have a mass of 2 kg, $v_2 = 2$ m/s and $v_3 = 4$ m/s, what are the coordinates of the center of mass at $t = 0$ (as shown in the figure)?

$$x_{cm} = \frac{\sum m_i x_i}{\sum m_i}$$

$$= \frac{2 \times 0 + 2 \times 2 + 2 \times 1}{6} = \boxed{1 \text{ m}}$$



$$y_{cm} = \frac{\sum m_i y_i}{\sum m_i}$$

$$= \frac{2 \times 0 + 2 \times 1 + 2 \times 0}{6} = \frac{2}{6} = \frac{1}{3} = \boxed{0.33 \text{ m}}$$

- (b) What is the velocity of the center of mass at $t = 0$?

$$\vec{v}_{cm} = \frac{\sum m_i \vec{v}_i}{\sum m_i} = \frac{2 \times 0 + 2 \times 2 \hat{i} + 2 \times 4 \hat{j}}{6}$$

$$= \frac{4}{6} \hat{i} + \frac{8}{6} \hat{j}$$

$$\boxed{\vec{v}_{cm} = 0.67 \hat{i} + 1.33 \hat{j}} \text{ m/s}$$

- (c) What is the acceleration of the center of mass?

$$\vec{a}_{cm} = 0 \quad \text{since } \vec{v}_{cm} \text{ is constant.}$$