

Physics 101- Chapter 2

Quiz No. 1

Name: Key

ID:

Sec: 29

Two mass points are moving, one of them on X axis, and the other on Y axis. The position given by:

$$x = \left(\frac{1}{3}t^3 + 3t^2 - 5\right) m, \quad y = (20t - t^2) m \text{ respectively on X axis, Y axis.}$$

- 1- At what time the two mass points will be equal in velocity.
- 2- The distance between them at that time.

- First:

$$v_x = \frac{dx}{dt} = t^2 + 6t$$

$$v_y = \frac{dy}{dt} = 20 - 2t$$

Second:

$$\text{Put } v_x = v_y$$

$$t^2 + 6t = 20 - 2t$$

$$t^2 + 8t - 20 = 0$$

$$(t + 10)(t - 2) = 0$$

Either $t = -10$ (Wrong value) Because, it is not real positive time.

or $t = 2$

The two mass points will be equal in velocity after 2 second.

2 - When $t = 2$, get the position of the two mass points

$$x_{t=2} = \left[\frac{1}{3} \times (2)^3\right] + [3 \times (2)^2] - 5 = 9.7 \text{ m}$$

$$y_{t=2} = (20 \times 2) - (2)^2 = 36 \text{ m}$$

The distance between them at $t = 2 \text{ s}$

$$\overline{AB} = \sqrt{x_{t=2}^2 + y_{t=2}^2} = \sqrt{(9.7)^2 + (36)^2} = \sqrt{94.09 + 1296} = 37.3 \text{ m}$$

