Answer on Question #48742, Physics, Mechanics | Kinematics | Dynamics

A particle move along the parabolic path x= y^2 + 2y + 2 in such a way that the y component of velocity vector remains 5m/s during the motion. The magnitude of the acceleration of particle is?

1. 50m/s^2
2. 100m/s^2
3. 10√2 m/s^2
4. 0.1m/s^2

Solution:

$$x = y^2 + 2y + 2$$

The first derivative is

$$\frac{dx}{dy} = 2y + 2$$

$$\frac{dx}{dy} = \frac{dx}{dt}\frac{dt}{dy} = v_x \frac{1}{v_y}$$

Thus,

$$v_x = (2y + 2)v_y$$

Since the y component of velocity remains the same, there is no acceleration along the y component, $a_y = 0$.

The acceleration is

$$a_x = \frac{dv_x}{dt} = \frac{dv_x}{dt}\frac{dy}{dy} = \frac{dv_x}{dy}\frac{dy}{dt}$$

$$\frac{dv_x}{dy} = 2v_y$$

Thus,

$$a_x = 2v_y v_y = 2 * 5 * 5 = 50 \text{ m/s}^2$$

Answer: 1. 50m/s^2