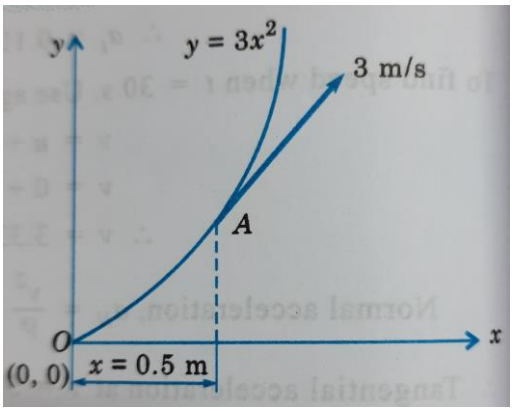
Class work problems on module 2.1 (Curvilinear motion) – 2022

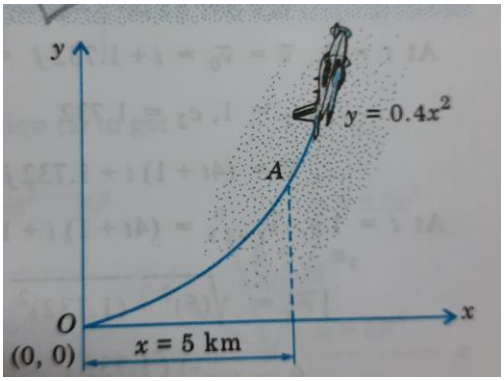
1. The speed of the racing car is increasing at a constant rate from 72 kmph to 144 kmph over a distance of 200 m along a curve of radius 250 m. Determine the magnitude of total acceleration after it has travelled 120 m.

2. A particle travels on a circular path whose arc distance travelled is defined by $s = (0.5t^3 + 3t)$ m. If the total acceleration is 10 m/s^2 at t = 2 sec, find the radius of curvature.

3. A particle moves with a constant speed of 3 m/s along the path shown in fig. What is the resultant acceleration at a position on the path where x = 0.5 m? Also represent the acceleration in vector form.



4. A jet plane travels along the parabolic path as shown in fig. When it is at point A, it has a speed of 200 m/s which is increasing at the rate of 0.8 m/s^2. Determine the magnitude of the acceleration of the plane when it is at A.



5. A particle moving in the x-y plane with y-components of velocity v_y = 6t m/s where t is in seconds. The x-component of acceleration of the particle is a_x = 3t m/s^2 where t is in seconds. When t = 0, x = 3 m and y = 0, and v_x = 0. Find the equation of the path of the particle. Determine the magnitude of the velocity of the particle at the instant when y = 10 m.

6. A particle moves in the x-y plane with velocity components $v_x = (8t - 2)$ and v_y = 2 m/s. If it passes through the point (x, y) = (14, 4) m at t = 2 sec., determine the resultant acceleration at t = 2 sec. Find also the path traced by particle.