

### Tutorial Exercises in Physics 1 / Set 3

#### *Exercise 1:*

A material point moves on a straight line following the following time equation:

$$\mathbf{x}(t) = 6t^2 + 16t$$

1. What is the position of this body at  $t = 1$  s
2. At what time  $t$ , does it pass through position O (origin)
3. Give the expression for the instantaneous speed, deduce its value at  $t = 0$  s
4. Give the expression for the instantaneous acceleration.

#### *Exercise 2:*

The coordinates of the mover M are given by:  $\mathbf{x} = \mathbf{at}$  ,  $\mathbf{y} = \mathbf{at}(1 - \alpha t)$

With  $a$  and  $\alpha$  are positive constants

1. Find the position, velocity, and acceleration vectors
2. Determine the equation of the trajectory and its nature

#### *Exercise 3:*

Let a material point M move according to the relations:  $\rho = 2ae^{\theta}$  ,  $\theta = \omega t$

With  $\omega$  and  $a$  are positive constants

1. Find position, velocity and acceleration vectors in polar coordinates
2. Find the normal and tangential components of the acceleration  $a_T$  and  $a_N$
3. Deduce the radius of curvature of the trajectory  $R$