Biskra University
First-year sciences and technologies
Module: *Physic 1*

Tutorials 3

Exercise 1:

In a Cartesian coordinate system (O, x, y), equipped with the basis vectors ($\vec{\imath}, \vec{\jmath}$) a moving point M has parametric equations: X=2cos(3t+2) et Y = 2sin (3t+2)

1. Give the equation of the trajectory, what is its nature?
2. Express the velocity vector $\vec{V}$, and determine its magnitude (modulus).
3. Give the acceleration vector $\vec{a}$, and determine its magnitude (modulus).
4. Give the Polar coordinates of point M.
5. Give the position, velocity and acceleration vectors in polar coordinates.

Exercise 2:

Consider a mobile M treated as a material point moving in the XOY plane. It is identified by its polar coordinates: r (t) = $t^2/4$; θ(t) = $\frac{\pi}{4}$ t (t in s. r in m et θ in rd).

1/ Express the position, velocity and acceleration vectors in polar coordinates.

2/ Calculate the magnitude (modulus) of the velocity vector and acceleration vector at t=6s.

3/ Give the Cartesian coordinates of point M.

4/ Deduce the expression of the velocity vector in Cartesian coordinates.

Exercise 3:

A mobile point M follows a plane trajectory given by the equations in polar coordinates $(0,\overrightarrow{e_r},\overrightarrow{e_\theta})$

$$\begin{cases} r(t) = e^t \\ \theta(t) = t \end{cases}$$ (t in s, r in met θ in rad)

1. Express ($\overrightarrow{e_r},\overrightarrow{e_\theta}$) in terms of fixed basis ($\vec{\imath}, \vec{\jmath}$).
2. Express the position vector $\overrightarrow{OM}$ in polar coordinates.
3. Calculate the velocity vector $\vec{V}$, and determine its magnitude (modulus).
4. Calculate the acceleration vector a, and determine its magnitude (modulus).
5. Deduce the position vector $\overrightarrow{OM}$ in Cartesian coordinates.