

## *Tutorial 1 (PHY201)*

1. A point moves in a circle at a constant speed of 50cm/s. The period of one complete journey around the circle is 6sec. At  $t=0$  the line to the point from the circle makes an angle of 30 degree with the x axis.
  - (a) Obtain the equation of the x coordinate of the point as a function of time, in the form  $x = A \cos(\omega t + \alpha)$ , giving the numerical values of A,  $\omega$ , and  $\alpha$ .
  - (b) Find the values of x,  $dx/dt$ ,  $d^2x/dt^2$  at  $t=2$  sec and plot the displacement vector, velocity vector and acceleration vector in the complex plane.
2. A circular hoop of diameter  $d$  hangs on a nail. What is the period of its oscillations at small amplitude?
3. A real spring is generally made up of some material and the mass of spring  $m$  cannot be neglected as compared to the mass  $M$  that hangs to it. Following your book of French, derive the oscillation frequency of such a heavy spring. By what % the true frequency is offset if  $m$  is 10% of  $M$ .
4. Show that multiplication of any complex number  $z$  by  $e^{i\Theta}$  is described, in geometrical terms, as a positive rotation through an angle  $\Theta$  of the vector by which  $z$  is represented, without any alteration of its length.
5. (i) Consider a metal wire of Young's modulus  $Y$  having a relaxed length  $L_0$ . It is clamped from the upper end. It is loaded with a mass  $m$  at the lower end and it elongates the wire. Find out the period of small oscillations of mass?  
(ii) Express your answer in terms of period of a simple pendulum. What would be effective length of the pendulum?