# Homework # 1

### Q1:

Consider a mass *m* connected to a spring with a stiffness constant *k*. If the frequency  $f_0$  of such spring is given by: 1  $\sqrt{k}$ 

$$f_0 = \frac{1}{2\pi} \sqrt{\frac{k}{m}}$$

- **1** Use the **Dimensional analysis** to find the dimensions of the spring constant *k*.
- 2- Compare these dimensions of k with those can be obtained from Hook's Law: F = -kx

#### Q2:

Suppose the position vector of a particle moves on a circle is given by:

$$\mathbf{r} = \mathbf{i} b \sin \omega t + \mathbf{j} b \cos \omega t$$

where  $\omega$  is a constant.

Show that the acceleration vector **a** of this motion is  $\bot$  to the velocity vector **v**.

## Q3:

Solve the following problems from your textbook:

#### 1.2, 1.4, 1.7, 1.10, 1.18, 1.20 & 1.30

#### Hints:

1.4- Use the shown cube as an example.

1.30- By finding the *dot* and the *cross* product of the two shown vectors **a** and **b**.



