RECITATION 1

1) Check that following equations are dimensionally correct.

(In equations, *x* is the distance, υ is the velocity, *t* is the time, *a* is the acceleration)

a) $x_s = x_i + \upsilon_{xi} t + \frac{1}{2} a t^2$

b) $\upsilon_{xs}^2 = \upsilon_{xi}^2 - 2a(x_s - x_i)$

2) The period *T* of a simple pendulum is measured in time units and is $T = 2\pi\sqrt{\frac{l}{g}}$ where *l* is the length of the pendulum and *g* is the acceleration of gravity. Find the dimension and SI unit of the period *T*.

3) Newton's law of universal gravitation is represented by $F = G\frac{Mm}{r^2}$. Here *F* is the magnitude of the gravitational force exerted by one object on another, *M* and *m* are the masses of the objects, and *r* is a distance. Use dimensional analysis to determine the SI units of the constant *G*.

4) The position of a particle moving under uniform acceleration is some function of time and the acceleration. Suppose we write this position $s = ka^m t^n$, where *k* is a dimensionless constant. Find the numerical values of the constants *m* and *n* by dimensional analysis.

5) Vectors $\vec{A}$, $\vec{B}$ ve $\vec{C}$ are defined as $A_x = 3$, $A_y = -2$, $A_z = 2$; $B_x = 0$, $B_y = 0$, $B_z = 4$; $C_x = 2$, $C_y = -3$, $C_z = 0$. Find the following calculations:

a) $\vec{A} \bullet (\vec{B} + \vec{C})$

b) $\vec{A} \times (\vec{B} + \vec{C})$

c) $\vec{A} \bullet (\vec{B} \times \vec{C})$

d) $\vec{A} \times (\vec{B} \times \vec{C})$

6) Two vectors are given by $\vec{A} = 2\hat{i} + 3\hat{j} + \sqrt{3}\hat{k}$ and $\vec{B} = 2\hat{i} - 3\hat{j} - \sqrt{3}\hat{k}$.

a) Find the $\cos\theta$ value of the angle between $\vec{A}$ and $\vec{B}$ vectors,

b) Find the unit vector which is normal to both $\vec{A}$ and $\vec{B}$ vectors.

7) A person going for a walk follows the path shown in Figure 1. The total trip consists of four straight-line paths. At the end of the walk, what is the person's resultant displacement measured from the starting point?

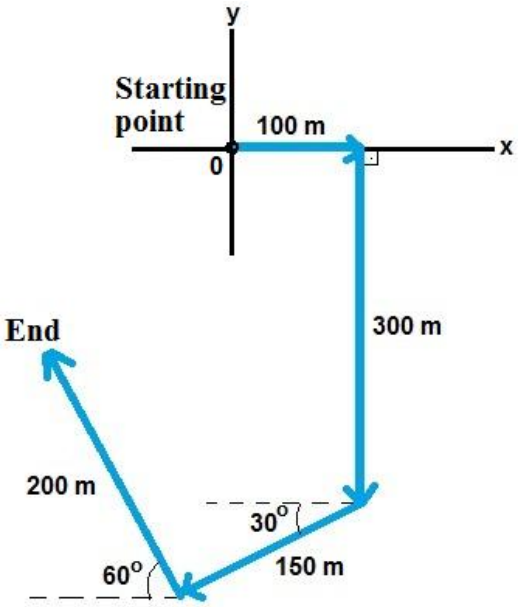

Figure 1