Tutorial N°1.2: Dimensional analysis and vector calculation

Exercise 8 :

If the velocity V (in cm/s) of a particale is given in term of time (in sec) by the equation $V = at\ \frac{b}{t+c}$.

- Give the dimensions of a, b and c.

Exercise 9

For the equation $F = A^a v^b d^c$ where F is force, A is area, v is velocity and d is density, using the dimentional analysis give the following values for the exponents.

Vector calculation

Exercise 10 :

- What is the unit vector along $\vec{A} = \hat{\imath} + \hat{\jmath}$
- Calculat the angle between two vectors $\vec{A} = -3\hat{\imath} + 6\hat{k}\ and\ \vec{B} = 2\hat{\imath} + 3\hat{\jmath} + \hat{k}$

Exercise 11

Find cross produt of two vectrors $\vec{A}\ and\ \vec{B}$ using Determinant method.

$$\vec{A} = 5\hat{\imath} + 3\hat{\jmath} + 7\hat{k} \quad ; \quad \vec{B} = 3\hat{\imath} - 2\hat{\jmath} - 8\hat{k}$$

Exercise 12

A force $\overrightarrow{F_1} = 2\hat{\imath} + 3\hat{\jmath} + \hat{k}$ (N) and another force $\overrightarrow{F_2} = \hat{\imath} + \hat{\jmath} + \hat{k}$ (N) are acting on a body. Calculat the magnitude of the total force acting on this body.

Exercise 13

A force $\overrightarrow{F_1} = 3\hat{\imath} + 4\hat{\jmath} + 5\hat{k}$ (N) acting on a body produces a velocity $\vec{v} = 2\hat{\imath} - \hat{\jmath} + 3\hat{k}$ $(m.s^{-1})$, calculat the power.

Exercise 14 :

The torque of a force $\overrightarrow{F} = -3\hat{\imath} + \hat{\jmath} + 5\hat{k}$ (N) acting at a point is τ. If the position vector of the point is $\vec{r} = 7\hat{\imath} + 3\hat{\jmath} + \hat{k}$. Calculat $\vec{\tau}$.