Assignment – 1

Vector Analysis – 2nd sem

27/05/21

(1) Deduce the condition for the vectors $2\hat{i} + 3\hat{j} - 4\hat{k}$ and $3\hat{i} - a\hat{j} + b\hat{k}$ to be parallel (or collinear)

(2) Deduce the condition for coplanarity of three vectors $\vec{A}$, $\vec{B}$ and $\vec{C}$.

(3) Find the gradients of the following functions:

(a) $f(x, y, z) = x^2 + y^3 + z^4$

(b) $f(x, y, z) = x^2 y^3 z^4$

(c) $f(x, y, z) = e^x \sin(y) \ln z$.

(4) Calculate the divergence of the following vector functions.

(a) $\vec{V}_a = x^2\hat{x} + 3xz^2\hat{y} - 2xz\hat{z}$

(b) $\vec{V}_b = xy\hat{x} + 2yz\hat{y} + 3zx\hat{z}$.

(c) $\vec{V}_c = y^2\hat{x} + (2xy + z^2)\hat{y} + 2yz\hat{z}$.

(5) The range of x for which angle between the vectors $\vec{A} = 2x^2\hat{i} + 4x\hat{j} + \hat{k}$ and $\vec{B} = 7\hat{i} - 2\hat{j} + x\hat{k}$ is obtuse is equal to:

(a) $x < 0$ (b) $x > 1/2$ (c) $0 < x < 1/2$ (d) None.

(6) Find the value of m for which $\vec{A} = \hat{i} - \hat{j} - 2\hat{k}$, $\vec{B} = 3\hat{i} + 5\hat{j} + 6\hat{k}$, $\vec{C} = -\hat{i} + 4\hat{j} + m\hat{k}$ will be co-planar.