Tutorial N°2

Exercise 1 :

We have the following two functions

A scalar function: $f(x,y,z) = 2xy^2z$. And a vector function :$\vec{V}(x,y,z) = 2xy\hat{\imath} - yz\hat{\jmath} + 3xy\hat{k}$.

1/ Find the gradient of the scalar function $f(x,y,z)$.

2/ Find the divergence of the vector function $\vec{V}(x,y,z)$.

3/ Find the rotation of the vector function $\vec{V}(x,y,z)$.

Exercise 2

Rectangular coordinats (x,y,z) of a point are given. Find the cylindrical coordiantion (ρ,φ,z) of the point:

$$P_1:(1,\sqrt{3},2) \quad ; \quad P_2:(1,1,5) \quad ; \; P_3:(-2\sqrt{2},2\sqrt{2},4)$$

Exercise 3 :

Cylindrical coordiantion (ρ,φ,z) of a point are given. Find the rectangular coordinats $(x,y,z)$of the point:

$$P_1:\left(4,\frac{\pi}{6},3\right) \quad ; \quad P_2:(2,\pi,-4) \quad ; \; P_3:(-2\sqrt{2},2\sqrt{2},4)$$

Exercise 4

Rectangular coordinats (x,y,z) of a point are given. Find the spherical coordiantion (r,θ,φ) of the point:

$$P_1:(4,0,0) \quad ; \quad P_2:(-1,2,1) \quad ; \; P_3:(0,3,0)$$

Exercise 5

Spherical coordiantion (r,θ,φ) of a point are given. Find the rectangular coordinats $(x,y,z)$of the point:

$$P_1:(3,0,\pi) \quad ; \quad P_2:\left(1,\frac{\pi}{6},\frac{\pi}{6}\right) \quad ; \; P_3:\left(12,-\frac{\pi}{4},\frac{\pi}{4}\right)$$

Exercise 6

Cylindrical coordinats (ρ,φ,z) of a point are given. Find the spherical coordiantion (r,θ,φ) of the point:

$$P_1:\left(1,\frac{\pi}{4},3\right) \quad ; \quad P_2:(5,\pi,12) \quad ; \; P_3:\left(3,-\frac{\pi}{4},3\right)$$

Exercise 7 :

Spherical coordiantion (r,θ,φ) of a point are given. Find the cylindrical coordinats (ρ,φ,z) of the point:

$$P_1:\left(2,-\frac{\pi}{4},\frac{\pi}{2}\right) \quad ; \quad P_2:\left(4,\frac{\pi}{4},\frac{\pi}{6}\right) \quad ; \; P_3:\left(8,\frac{\pi}{3},\frac{\pi}{2}\right)$$