Tut-3

(1) Show that, $\vec{A} = \dfrac{-x\,\hat{x} - y\,\hat{y}}{\sqrt{x^2+y^2}}$ is a sink

[Hints $\vec{\nabla}\cdot\vec{A} < 0$]

(2) Find the values of a, b, c so that the ~~[illegible]~~ vector field

$$\vec{A} = (x+2y+az)\,\hat{x} + (bx-3y-z)\,\hat{j} + (4x+cy+2z)\,\hat{z}$$ is irrotational.

[Hint: $\vec{\nabla}\times\vec{A} = 0$ for irrotational field]

(3) Show that $\vec{A} = (2xy+z^3)\,\hat{x} + x^2\,\hat{y} + 3xz^2\,\hat{z}$ is a conservative field.

[Hint: For conservative field $\oint \vec{A}\cdot d\vec{l} = 0$

$\oint \vec{A}\cdot d\vec{l} = \iint_S (\vec{\nabla}\times\vec{A})\cdot d\vec{s}$, so $\vec{\nabla}\times\vec{A} = 0$ for conservative]

(4) Find a unit vector normal to the surface

$\phi = 2x^2 + 4yz - 5z^2 - 5 = 0$ at a point $P(3,-1,2)$

[Hints: calculate $\vec{\nabla}\phi \rightarrow$ direction is $\perp^r$ to the surface ϕ]

(5) What is the angle between two surface ϕ_1 & ϕ_2 where $\phi_1 \Rightarrow x^2+y^2+z^2-16=0$ & $\phi_2 \Rightarrow x^2+y^2-z=4$ at a point $(2,-1,2)$