

1 Elementary Mechanics Phy-101

Assignment-I Due Date: 7th November, 2019

Q.1: Prove the following identities

i) $\nabla \cdot \nabla \times \phi = 0$

ii) $A \times (B \times C) + B \times (C \times A) + C \times (A \times B) = 0$

iii) $\nabla \times (A \times B) = (B \cdot \nabla)A - (A \cdot \nabla)B + A(\nabla \cdot B) - B(\nabla \cdot A)$

Q.2: Find the gradient of the following function

$$f(x, y, z) = e^x \sin(y) \ln(z) \quad (1)$$

Q.3: Find divergence and Curl of the following function

$$\mathbf{v} = (2xy + 3y^2)\hat{j} + (4yz^2)\hat{k} \quad (2)$$

Q.4: Give short answers to the following questions

- i) prove that curl of gradient of scalar function is always zero.
- ii) Find the divergence of a position vector given by $\vec{r} = x\hat{i} + y\hat{j} + z\hat{k}$.
- iii) Find the divergence of the function v where $v = \frac{\hat{r}}{|\vec{r}|}$. \hat{r} is unit vector for position vector in three dimension.