

ASSIGNMENT 9 SOLUTIONS

- (1) (i) $\nabla f = 4\hat{i} + \hat{j} - \hat{k}$; $\hat{n} = \frac{4\hat{i} + \hat{j} - \hat{k}}{3\sqrt{2}}$ (ii) $\nabla f = 2\sqrt{10}\hat{i}$; $\hat{n} = \hat{i}$
- (2) (i) $\frac{-1}{\sqrt{5}}$ (ii) $\frac{-e}{\sqrt{3}}$ (iii) $\frac{-1}{16\sqrt{6}}$ (iv) $\frac{-1}{2}$
- (5) (i) $3xy^2z\hat{i} - (y^3z - 4xz)\hat{j}$ (ii) $-x^3y^3z\hat{i} + 2x^2y^4z\hat{j} + (2x^3z^2 - 2xy)\hat{k}$ (iii) $4x^2yz^2 + x^2$
- (6) 0
- (7) $\frac{11}{15}$
- (8) $\frac{1}{2}$
- (10) Integral is path independent and value is $= \frac{-1}{2}$
- (12) (i) $\text{curl}(\mathbf{F})=0$. hence conservative and potential function is $\phi(x, y, z) = x^2y + y^2z + k$
- (ii) conservative and potential function is $\phi(x, y, z) = x^2y + z^3x + k$
- (13) -20 (note: Here don't use Gauss Divergence thm as volume is not enclosed by the surface.)
- (14) 0
- (15) verified and value of integral is $\frac{-1}{20}$
- (16) -8
- (17) integral value $= \frac{3}{2}$
- (18) 60π
- (19) integral value is $\frac{3\pi}{2}$
- (20) integral value is 25