Math 2443-006   Quiz II   Name: _Soln s_

Q1].. Find the rate of change of the function $f(x, y, z) = (y^2 + \sin z)e^{-x}$ at the point $(0, 2, \pi)$ in the direction towards the point $(1, 1, 0)$.

$f_x = -e^{-x}(y^2 + \sin z)$

$f_y = 2y e^{-x}$

$f_z = \cos z \, e^{-x}$

$\nabla f(0, 2, \pi) = \langle -1(4 + \sin \pi), 4(1), \cos \pi (1) \rangle$

$= \langle -4, 4, -1 \rangle$

$\bullet (0, 2, \pi)$

$\vec{u} = \langle 1-0, 1-2, 0-\pi \rangle$

$(1, 1, 0)$

$= \langle 1, -1, -\pi \rangle$

$\hat{u} = \dfrac{\langle 1, -1, -\pi \rangle}{|\langle 1, -1, -\pi \rangle|}$

$= \dfrac{\langle 1, -1, -\pi \rangle}{\sqrt{\pi^2 + 2}}$

$D_{\hat{u}} f(0, 2, \pi) = \langle -4, 4, -1 \rangle \cdot \dfrac{\langle 1, -1, -\pi \rangle}{\sqrt{\pi^2 + 2}}$

$= \dfrac{-8 + \pi}{\sqrt{\pi^2 + 2}}$