King Fahd University of Petroleum and Minerals
Department of Mathematics and Statistics
Math 302-04 Quiz No 2
Name:

Exercise #1: Let

$$\varphi(x, y, z) = 2x^2 + 3y^2 - 5z$$

a) Find the directional derivative of φ at $(1, 1, 1)$ in the direction $\mathbf{v} = \mathbf{i} - \mathbf{j} + 2\mathbf{k}$

b) Find the equations of the tangent plane and normal line to the surface $\varphi(x, y, z) = 0$ at the point $(1, 1, 1)$.

Exercise #2: Evaluate the divergence of the field

$$F(x, y, z) = \frac{x^2}{z}\mathbf{i} - y\mathbf{j} + xz\mathbf{k}$$

at the point $P(1, 2, -1)$.

Exercise #3: Find the curl of

$$F(x, y, z) = xy\mathbf{i} - z^2x\mathbf{j} + yz\mathbf{k}$$

Exercise #4: Let ∇^2 denote $\nabla \cdot \nabla$ in 3-space. Show that $u = x^2 - y^2 - 2xz$ satisfies the equation $\nabla^2 u = 0$.