

(1) Find the directions in which the directional derivative of $f(x,y) = ye^{-xy}$ at the point $(0,2)$ has the value 1.

(2) Find the parametric equations for the tangent line to the curve of intersection of the paraboloid $z = x^2 + y^2$ and the ellipsoid $4x^2 + y^2 + z^2 = 9$ at the point $(-1, 1, 2)$.

[Hint: the tangent line is orthogonal to ~~the~~ both normal ~~to the~~ directions to the surfaces.]

(3) Find equations ~~to the~~ of (a) the tangent plane and (b) the normal line of the surface $x - z = 4 \arctan(yz)$, at the point $(1+\pi, 1, 1)$.

(4) If $xyz = \cos(x+y+z)$, find $\frac{\partial z}{\partial x}$ and $\frac{\partial z}{\partial y}$.

(5) Find the maximum rate of change of f at the ~~given~~ ~~point~~ point $(-5, 1, 1)$ where $f = \tan(x+2y+3z)$. What direction does it occur?