

Calculus III, Worksheet #7

1. Using implicit differentiation to find the $\frac{\partial z}{\partial x}$ and $\frac{\partial z}{\partial y}$ of $yz + x \ln y = z^2$.
2. If $f(x, y, z) = xy^2z^3 + \arcsin(x\sqrt{z})$, find f_{xyz} . Which order of differentiation is easiest? Also find $f_{xyz}(1,1,1)$.
3. Prove or disprove that $u = \frac{1}{\sqrt{x^2+y^2+z^2}}$ satisfy three dimensional Laplace equations.
4. Find the linear approximation of $f(x, y) = \sqrt{y + \cos^2 x}$ at $(0,0)$.
5. Find the differential of $L = xze^{-y^2-z^2}$.
6. Find the directional derivative of $h(r, s, t) = \ln(3r + 6s + 9t)$ at $(1,1,1)$ along $\bar{v} = 4i + 12j + 6k$.
7. Find the maximum rate of change of $f(p, q, r) = \arctan(pqr)$ at $(1,2,1)$.