

Problem Set 11

1. Find the first partial derivatives of the function $f(x,t) = e^{-t} \cdot \cos(\pi \cdot x)$
2. Find the first partial derivatives of the function $f(x,y,z) = x \cdot \sin(y - z)$
3. Find $f_y(2, 1, -1)$ for the function $f(x,y,z) = \frac{y}{x+y+z}$
4. Use implicit differentiation to find $\frac{\partial z}{\partial x}$ and $\frac{\partial z}{\partial y}$ for the function $x^2 + 2y^2 + 3z^2 = 1$.
5. Find all second partial derivatives for $f(x,y) = x^3y^5 + 2x^4y$.
6. Verify that $u_{xy} = u_{yx}$ for the function $u = x^4y^3 - y^4$.
7. Find f_{xxx} and f_{xyx} for the function $f(x,y) = x^4y^2 - x^3y$.
8. Determine if $u = x^3 + 3xy^2$ is a solution of Laplace's equation $u_{xx} + u_{yy} = 0$.
9. Show that $u = (x - at)^6 + (x + at)^6$ is a solution to the wave equation $u_{tt} = a^2u_{xx}$.
10. For three resistors in parallel, $\frac{1}{R} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}$. Find $\frac{\partial R}{\partial R_1}$.