

Midterm Review Questions

Elizabeth Jung
Ji Yoon Lee

Problem 1

Find the Jacobian matrix for the following function

$$f(x, y, z) = (\sin xy, x^{y \sin z}, e^z)$$

Problem 2

Chain Rule: another ant and the temperature of a plane problem

The temperature at a point (x, y) in the plane is given by $T(x, y) = .5x^2y^4 + 7x^3y$. An ant crawls on the plan such that its position after t seconds is given by $x = t \cos t$ and $y = \sin t^2$. Find the rate of change of temperature along the ant's path when $t = 2$.

Problem 3: Spivak 2-17 modified

Find the partial derivatives of the following functions:

(a) $f(x, y, z) = z$

(b) $f(xy) = \sin(x \sin y)$

Problem 4: Spivak 2-20 modified

Find the partial derivatives of the following functions:

(a) $f(x, y) = g(x)$

(b) $f(x, y) = g(y)$

(c) $f(x, y) = g(xy)$

Problem 5: Spivak 2-22

If $f : \mathbb{R}^2 \rightarrow \mathbb{R}$ and $D_2f = 0$, show that f is independent of the second variable. If $D_1f = D_2f = 0$, show that f is constant.