Mustansiriyah University/ Faculty of Engineering   Mathematics Lecture

Mechanical Engineering Dept.   Dr. Hayder Mohammad   2ⁿᵈ class

Homework/ Partial Derivatives

Q1/ Let :

$$f(x, y, z) = 3x^2 - 5zy + xyz$$

Find the directional derivative of f at (2,2,7) in the direction of $\vec{v} = i + j - k$.

Q2/ Let :

$$f(x, y, z) = \sqrt{x + 2yz}$$

Find the directional derivative of f at (0,2,1) in the direction of $\vec{v} = 0i + 3j + 4k$.

Q3/ Find all the local maxima, local minima, and saddle points of the function:

$$f(x, y) = e^{-(x^2 + y^2)}$$

Q4/ Find all the local maxima, local minima, and saddle points of the function:

$$f(x, y) = 2x^3 + 6xy^2 - 3y^3 - 150x$$

Q5// Evaluate **dw/dt** by using the Chain Rule if

$$w = x^2 yz, \quad x = e^t, \quad y = t, \quad z = 1 + t, \quad t = 1$$

Q6/ Evaluate $\frac{\partial z}{\partial u}$ and $\frac{\partial z}{\partial v}$ at the given point (u, v) for

$$z = 4e^x \ln y \quad , \quad x = \ln(u\cos(v)) \quad , \quad y = u\sin(v); \quad (u, v) = (2, \frac{\pi}{4})$$

Q7/ Find the absolute maxima and minima of the function on D, where D is the closed triangular region with vertices (0,0), (0,2), and (4,0).

$$f(x, y) = x + y - xy$$

Q8/ Find the absolute maxima and minima of the function on D, where

$$f(x, y) = xy^3$$

and

$$D = \{(x, y)|\ x \geq 0, \qquad y \geq 0,\ x^2 + y^2 \leq 1\}$$