

SQ2-M251-SP2025

1- Evaluate $\lim_{(x,y) \rightarrow (3,0)} x^3 \frac{\sin y}{y}$

2- Determine whether or not $\lim_{(x,y) \rightarrow (0,0)} \frac{x^3 y}{x^4 + y^2}$ exists,

$\lim_{(x,y) \rightarrow (0,0)} \frac{xy^2}{x^4 + y^4}$ exists, $\lim_{(x,y) \rightarrow (0,0)} \frac{x^2 y}{x^2 + y^2}$ exists

3- use the definition of partial derivative to calculate $\frac{\partial}{\partial x}(x^2 y)$

4- Let $g(x,y) = \frac{xy^2}{x^2 + y^2}$, Find $\frac{\partial^2 g}{\partial x \partial y}$.

5- What are requirement for $f(x,y)$ to be differentiable.
Is $f(x,y) = x^2 + 3xy^2$ differentiable on \mathbb{R}^2 ?

6- Let $f(x,y,u,v) = \frac{x^2 + e^{uv}}{3y^2 + \ln(2+u^2)}$. Find f_{uvxyvu} .

7- Find the linearization of $f(x,y) = x^2 \sqrt[3]{y}$ at $(x,y) = (1,8)$.

8- Find the eqn of the tangent plane to $f(x,y) = \frac{\sqrt{y}}{x^2}$ at point $P = (2,4)$. And approximate $\frac{\sqrt{4.02}}{(2.01)^2}$

9- Approximate $(1.02)^3 \sqrt[3]{8.3}$.

10- Find the gradients of the functions:

$g(x,y,z) = (x^2 + y^2 + z^2)^4$, $g(x,y,z) = (x^2 - 2xy + z^2 - 2)^2$

11- Find the directional derivative of xye^{x^2+y} in the direction of $v = \langle 2, 3 \rangle$.

- 12- Find the directional derivative of $f(x,y) = x^2y + xy^2$ in the direction of a) $\vec{v} = \langle 2, 3 \rangle$, b) $\vec{v} = \langle 1, 2 \rangle$.
- 13- Find the tangent plane to the surface: $4x^2 + 9y^2 - z^2 = 16$ at $p = (2, 1, 2)$.
- 14- let $f(x,y) = x^2 + y^2 + xy$, where $x = r^2$ and $y = r \cos \theta$. Find $\frac{\partial f}{\partial \theta}$ and $\frac{\partial f}{\partial r}$ at $(r, \theta) = (2, \frac{\pi}{2})$.
- 15- check if the function $f(x,y) = x^3 - 2xy + 2y^2 + y$ has a critical pt. and find it.
- 16- Find the critical points of the function $f(x,y) = x^3 + y^4 - 6x - 2y^2$ and determine whether they are local minima, local maxima or saddle pt by the 2nd derivative test or the state that the test fails.
- 17- Find the global extreme values of $f(x,y) = x^2 + 2xy^2$ on $x^2 + y^2 \leq 1$.