

TEST 2

Make sure to show all your work and underline the final results of each problem. Write your name on this sheet and use it as a cover page when you turn in your work. Do not write your results or computations on this paper. Good luck!

1. Find the linearization of $f(x, y) = \ln(x^2 - 3y^2)$ at $(2, 1)$ and use it to approximate $f(1.9, 2.1)$.

2. If $f(x) = e^{x^2/2}$ and $x = \sin(rs)$ find

$$\frac{\partial^2 f}{\partial r \partial s}$$

in terms of r and s .

3. If $f(x, y) = x^2 - y^2/3$, compute the gradient vector $\nabla f(2, 3)$ and use it to find the tangent line to the level curve $f(x, y) = 1$ at the point $(2, 3)$. Sketch the level curve, the tangent line and the gradient vector.

4. Find the point on the surface $y + x^2 + 2z^2 = 1$ where the tangent plane is perpendicular to the vector $\langle 1, 1/2, -1 \rangle$. Then give the equation of the tangent plane at that point.

5. Find the critical points of the function

$$f(x, y) = x^2 + y^2 + x^2y + 4$$

and decide for each critical point whether it is a local maximum, a local minimum or a saddle point.

6. Find the absolute maximum and minimum values of

$$f(x, y) = 4xy^2 - x^2y^2 - xy^3$$

on the closed triangle in the xy -plane with vertices $(0, 0)$, $(0, 6)$, and $(6, 0)$.

7. Sketch the region of integration for the iterated integral

$$\int_0^3 dy \int_{y^2}^9 dx y \cos(x^2).$$

Then evaluate the integral by first reversing the order of integration.

8. Find the volume of the solid under the paraboloid $z = 3x^2 + y^2$ and above the region bounded by $y = x$ and $x = y^2 - y$.