NAME____

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Mathematics 206a

Multivariable Calculus

Examination #1

Mr. Haines

(20) I. Suppose $f(x,y) = \dfrac{\sin x}{y}$

A. $\dfrac{\partial f}{\partial x}(x,y) =$

B. $\dfrac{\partial f}{\partial y}(x,y) =$

C. $\dfrac{\partial^2 f}{\partial x \partial y}(x,y) =$

D. $\dfrac{\partial^2 f}{\partial y \partial x}(x,y) =$

(10) II. Prove that the points (2, 1, 4), (3, 2, 5), and (5, 4, 7) lie on the same line by:

A. Finding a parametric equation for that line

B. Then finding values of the parameter in your equation that give these three points.

(10) III. $\mathbf{A}(t) = (1+t, \ln t, 1, t^2)$ is a parametrization of a path in 4-space. Give the equation of the tangent line to this path at the point where $t = 1$.

(5) IV. Here are the four corners of a parallelogram in $\Re^2$: (2, 2), (4, 7), (5, 9), and (3, 4). What is the area of the parallelogram?

(5) V. Give a unit vector in the direction of $\mathbf{u} = \begin{bmatrix} 10 \\ 0 \\ 5 \end{bmatrix}$

(5) VI. Give a parametrization of the plane whose coordinate equation is $2x - 3y + z = 0$.

(5) VII. Give the coordinate equation of the set of all points in $\Re^4$ which are 2 units from the point (1, 2, 3, 4) .

(5) VIII. Sketch the level curves for the function $f : \Re^2 \to \Re$ given by the rule $f(x, y) = x^2 y^2$ for values of c = 0, 1, 2, and 3 . Mark on your graph the value of c that corresponds to each curve.

(10) IX. Given the quadratic form $r(x, y, z) = xy + xz + yz$

A. Find a symmetric matrix **S** so that $r(x, y, z) = (x, y, z)\mathbf{S}\begin{pmatrix} x \\ y \\ z \end{pmatrix}$,

B. Is $r(x, y, z)$ positive definite, negative definite, or indefinite? Explain why.

(10) X. Give two examples of subsets of $\Re^2$, one for each one of these two conditions. You must write the set in the form $\{(x, y) \in \Re^2 \mid ....\}$.

A) open and bounded

B) closed and not bounded

(15) XI. Give examples of:

A. Equations of two distinct parallel lines in $\Re^3$.

B. A unit vector in $\Re^4$.

C. A function $f : \Re^2 \to \Re$ with a removable discontinuity.