NAME_____

I____II____III____IV____V____VI____VII____VIII____IX____X____TOTAL _____
(10) (10) (16) (16) (6) (10) (10) (8) (8) (6)

February 5 Mathematics 206a Mr. Haines
2009 Multivariable Calculus
Examination #1

(10) I. If $\mathbf{f} : \mathbb{R}^2 \to \mathbb{R}^3$ with rule $\mathbf{f}(x, y) = \left(e^{xy}, \sqrt{4-y}, \sqrt{y-x^2}\right)$,

sketch a graph of the domain of $\mathbf{f}$.

(10) II. Give an equation of the straight line passing through the points (1, 2, 3) and (3, 6, 7).

(16) III. If $f(x,y) = \ln(x^2 + y^2)$

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

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

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

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

(16) IV. If $\mathbf{a} = 3\mathbf{i} - \mathbf{j}$ and $\mathbf{b} = \mathbf{i} - 3\mathbf{j}$, compute these:

A. $\mathbf{a} \bullet \mathbf{b} =$

B. $\|\mathbf{b}\| =$

C. $\text{comp}_{\mathbf{a}}\mathbf{b} =$

D. $\mathbf{proj}_{\mathbf{a}}\mathbf{b} =$

(6) V. Explain why $\lim_{(x,y)\to(0,0)} \frac{xy}{x^2+y^2}$ does not exist.

(10) VI. For the quadratic form $p(x,y,z) = x^2 + 5y^2 - 10z^2 + 6xy - 4xz + 2yz$,

A. give a symmetric matrix S that is the matrix of this quadratic form.

B. By taking determinants and using Sylvester's Theorem, determine if p is positive definite, negative definite, indefinite, or none of these.

(10) VII. If $f: \mathbb{R}^2 \to \mathbb{R}$ with rule $f(x,y) = \frac{y^2}{x^2}$, sketch the level curves of f for c = 0, 1, 4, and 16.

(8) VIII. Give an equation of the plane through the point (1, 2, 3) with normal vector parallel to the line with equation $(x, y, z) = (2t + 1, 5t - 7, -t + 8)$.

(8) IX. The points (1, 1), (2, 4), and (7, 5) are three vertices of a parallelogram in $\Re^2$.

A. What is the fourth vertex of that parallelogram?

B. What is the area of that parallelogram?

(6) X. If **A**(t) = $\left(\cos t, t^2, \frac{1}{t}\right)$ with $t \geq \pi/2$ is a path in $\Re^3$, calculate **A**'(t), which denotes the derivative of **A**(t) .