

Name (Please Print) _____ Rec. Instr. _____

Your Signature _____ Class Time _____

ANAYTIC GEOMETRY AND CALCULUS III

Exam II

October 27, 1994

The point value of each problem is indicated in the left margin. You must show all of your work for full credit. Points will be deducted for faulty reasoning, for sloppy notation, and for failure to simplify answers, even if your answer is correct. You may use a calculator, your class notes, and any reference material. Explicitly cite, in some manner, any published formulae you use.

(10) 1. What is the natural domain of $f(x, y) = \frac{y}{\sqrt{x - y^2}}$?

Answer _____

(15) 2. Sketch the level curves at heights ± 4 for

$$f(x, y) = y^2 - x^2.$$

(15) 3. What does it mean to say that $f(x, y) = x^2 - y$ is differentiable at $(1, 1)$?

(15) 4. Find $\nabla(x^2 + yz - 2xy - z^2)$ at $P_0 = (2, 1, 3)$.

Answer _____

(15) 5. Let \mathbf{r} be a planar curve with $\mathbf{r}(1) = (1, 1)$ and $\frac{d\mathbf{r}}{dt}(1) = (2, 3)$.

Let $f(x, y) = e^{xy}$. Find $\frac{d}{dt}(f \circ \mathbf{r})(1)$.

Answer _____

(15) 6. Find $\frac{\partial}{\partial x}(uv)^{1/2}$ if $u = (x - y)^{1/2}$ and $v = (x + y)^{1/2}$.

Answer _____

(15) 7. Let $f(x, y) = \begin{cases} 1 & \text{if } x = y \neq 0 \\ 0 & \text{if otherwise.} \end{cases}$

(a) Show that f is not continuous at $(0, 0)$.

(b) Show that $f_x(0, 0) = 0 = f_y(0, 0)$.