

Name (Please Print) _____ Rec. Instr. _____

Your Signature _____ Class Time _____

ANALYTIC GEOMETRY AND CALCULUS III

Alternate Final Exam

Spring 1995

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.

(24) 1. What is the volume of the parallelepiped determined by the vectors

$$\mathbf{a} = (3, 2, -1),$$

$$\mathbf{b} = (-2, 5, 1), \quad \text{and}$$

$$\mathbf{c} = (2, 1, 5)?$$

Answer $V =$ _____

(24) 2. Describe the track of $\mathbf{r} = (t-1)\mathbf{i} + (2t^2 - 4t + 1)\mathbf{j} + \mathbf{k}$ as the intersection of two surfaces in \mathbb{R}^3 .

Answer _____

- (28) 3. Use Lagrange Multipliers to find the points on the surface $z = 5 + xy$ which are closest to the origin.

Answer _____

- (24) 4. Find the directional derivative of $f(x, y) = 10 + xy + xz + yz$ at $P = (1, 2, 3)$ in the direction $\mathbf{u} = \left(\frac{1}{3}, \frac{2}{3}, \frac{-2}{3}\right)$.

Answer _____

(28) 5. Locate and classify the local extrema of

$$f(x, y) = x^3 + y^3 + 3xy + 3.$$

Answers: local maxima at _____

local minima at _____

saddle points at _____

(24) 6. What is the area of the region outside the circle $r = 1$ and inside the limaçon $r = 2 + \cos \theta$?

Answer _____

(24) 7. Evaluate $\int_0^2 \int_0^{\sqrt{2x-x^2}} \frac{1}{\sqrt{x^2+y^2}} dy dx$.

Answer _____

- (24) 8. What is the surface area of the portion of the saddle-shaped surface $z = xy$ which is cut by the cylinder $x^2 + y^2 = 9$?

Answer $S =$ _____