

Math 275-030
June 18, 2007

Exam 2 Name _____

This test consists of 100 points and 5 pages, none of which is intentionally left blank. Take a few seconds right now to be sure you have all the pages. The point value of each question is to the left of the question number. Show all your work in the space provided. If you run out of room for an answer, continue working on the back of the page. Your answers must be justified by your work.

- (10) 1. Let $\mathbf{r}(t) = t^2 \sin(t\pi)\mathbf{i} + t \cos(t\pi)\mathbf{j} + 2t^2\mathbf{k}$. Find the tangential and normal components of the acceleration at the time $t = 2$

- (10) 2. Find all second partial derivatives for

$$f(x, y) = x^2 \sin(xy) + y^2 \cos(xy)$$

$$\text{Let } f(x, y) = \frac{x^2 - y^2}{x^2 + y^2}.$$

- (5) (a) Draw the level curves for f at elevations $2, -1, 0, 1, 2$.

- (5) (b) Explain how these curves show that

$$\lim_{(x,y) \rightarrow (0,0)} f(x, y)$$

does not exist.

(10) 3. Find the directional derivative of $f(x, y) = xy^3$ in the direction of $\mathbf{u} = 5\mathbf{i} + 12\mathbf{j}$ at the point $(1, 1)$

(10) 4. Find the tangent plane to $f(x, y, z) = z^2 e^{x\sqrt{y}} = 16$ at the point $(0, 4, 2)$

(10) 5. Let $f(x, y) = x^2(1 - \sqrt{y})$. Use a linearization of f at the point $(1, 1.96)$ to find approximate $f(1.01, 1.98)$. ($\sqrt{1.96} = 1.4$)

6. Let $f(x, y) = (x^2 + y^2) \cos(x + 2y)$
- (5) (a) Show $(0, 0)$ is a critical value of f .
- (5) (b) Determine if $f(0, 0)$ is a maximum or a minimum.
- (10) 7. Find the absolute maximum and minimum of $f(x, y) = 5x^2 - 2y^2 + 10$ on the disk $x^2 + y^2 \leq 1$

- (10) 8. Use lagrange multipliers to find the minimum distance from the point $(0, b)$ (b is a constant) to the parabola $x^2 - 4y = 0$.

- (10) 9. Find the maximum of $f(x, y) = xy$ on the circle $(x + 1)^2 + y^2 = 1$