Midterm II

MAC 2313 Fall 2006

Full Name:_____ Score: _____

Show all of your work for full credit.

1. Evaluate the limit or show that the limit does not exist:

$$lim_{(x,y)\to(0,0)} \frac{10yx}{2y^2 + 4x^2}$$

2. Given the function

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

Find the following:

(a) f_x

(b) f_y

(c) f_{xy}

3. Find the linearization of the function

$$f(x, y) = \cos(x^2 + 3y)$$

at the point $(\sqrt{\pi}, -\frac{\pi}{3})$

4. Given the function

$$\begin{aligned} f(x,y,z) &= x^2+y^2+z^2 \\ & \text{where} \\ x(r,\theta,\phi) &= r\cos(\theta) \\ y(r,\theta,\phi) &= r\sin(\theta) \\ z(r,\theta,\phi) &= \phi \end{aligned}$$

Find:

(a) $\frac{\partial f}{\partial x}$

(b) $\frac{\partial f}{\partial r}$

5. Find the directional derivative of $f(x, y, z) = x^2 + \frac{y}{z}$ at the point $(1, 1, 1)$ in the direction $\vec{v} = < 1, 0, 1 >$.

6. Find and classify all critical points of the function $f(x, y) = x^2y - x^2 + y - y^2$

7. Given that $|\vec{r}(t)| = c$, (a constant), show that $\vec{r}(t)$ is orthogonal to $\vec{r}\,'(t)$ for all t.