KING FAHD UNIVERSITY OF PETROLEUM AND MINERALS DEPARTMENT OF MATHEMATICAL SCIENCES MATH 201 Exam # 3 Dec. 14, 2004

NAME:	Sec.#:	ID#:	
	11	11	

SHOW ALL YOUR WORK

1. For the surface $x^2 + y^2 - z^2 = 1$.

- (a) **(3 points)** Sketch the graph of the surface showing its points of intersection with the coordinate axis. Name the surface.
- (b) (3 points) Sketch the surface that results from reflecting this surface about the plane (i) y = x, (ii) x = z, (iii) y = z.

2. (4 points) Find an equation of the surface $z = -\sqrt{x^2 + y^2}$ in (a) cylindrical coordinates and (b) spherical coordinates. Simplify your answer as much as possible.

- 3. (a) (3 points) Sketch the domain of the function $f(x, y) = \frac{1}{\sqrt{x^2 y}}$. Use solid lines for portions of the boundary included in the domain and dashed lines for portions not included.
 - (b) (2 points) Repeat part (a) for the function $f(x, y) = \sqrt{y^2 x^2}$.
 - (c) (2 points) Let $f(x, y, z) = x^2 y^3 \sqrt{z+t}$. Find $f(\sqrt{5}, 2, \pi, 3\pi)$.

4. (3 points) Let f(x, y, z) = xyz + 3. Find an equation of the level surface that passes through the point (a) (1, 0, 2), (b) (-2, 4, 1), (c) (0, 0, 0).

- 5. (a) (2 points) Compute $\lim_{(x,y)\to(0,0)} y \ln(x^2 + y^2)$ by changing to polar coordinates.
 - (b) (3 points) Show that $\lim_{(x,y)\to(0,0)} \frac{xy}{5x^2-2y^2}$ does not exist.

- 6. (a) **(2 points)** Given $w = e^y \cos x$, find $\frac{\partial^3 w}{\partial y^2 \partial x}\Big|_{(\pi/4,0)}$.
 - (b) (3 points) The total resistance R of two resistances R_1, R_2 connected in parallel is given by $\frac{1}{R} = \frac{1}{R_1} + \frac{1}{R_2}$. Suppose that R_1, R_2 are measured with a maximum error of 5%. Use differentials to approximate the maximum percentage error in the calculated value of R.