Calculus III, Mathematics 2210-90

Examination 3, July 17,19, 2003

You may use graphing calculators and a Table of Integrals. Each problem is worth 20 points. You MUST show your work. Just the correct answer is not sufficient for any points.

1. Find
$$\iint_R xy^2 dxdy$$

where R is the region in the plane given by the inequalities $x \geq 0$, $x^2 - 1 \leq y \leq 1 - x^2$.

2. Find the volume under the plane $z = x + 2y + 1$ over the triangle bounded by the lines $y = 0$, $x = 1$, $y = 2x$.

3. A lamina (that is, a thin plate) lies over the region in the first quadrant bounded by the circle $x^2 + y^2 = 1$. The density of the material in the lamina is $\delta(x,y) = \sqrt{x^2 + y^2}$. What are the coordinates of the center of mass of the lamina?

4. Find the volume of the elliptical cone bounded by the surfaces $z^2 = x^2 + 4y^2$, $0 \leq z \leq 5$.

5. The upper hemisphere of radius 3, $H : x^2 + y^2 + z^2 \leq 9$, $z \geq 0$ is filled with a material whose density at the point (x, y, z) is $\delta(x, y, z) = (x^2 + y^2 + z^2)^{3/2}$. Find the mass of this solid.