Test #3 100 points Math 200 Name:________________________________________

**Simplify your final answers. Show work or some other defense of your answers.**

1) Use cylindrical coordinates to evaluate I = $\int_{-1}^{1}\int_{0}^{\sqrt{1-x^2}}\int_{0}^{1-x^2-y^2} x^2+y^2\, dzdydx$. (10 points)

2) Set up, **BUT DO NOT EVALUATE**, an integral in spherical coordinates that is equal to I = $\iiint_E z\, dV$ if E lies between the spheres of radius 2 and 4, but above the cone $z=\sqrt{3x^2+3y^2}$. (10 points)

3) Find the curl and divergence of $\vec{F}=\langle e^y, xe^y, ye^z\rangle$. (10 points)

4) Find the flux of $F = \langle y, x, z \rangle$ through the piece of $z = xy$ that lies inside $x^2 + y^2 = 1$ and is oriented up. (15 points)

5) Use **Green's** Theorem to evaluate $\int_C \vec{F} \cdot d\vec{r}$ if $\vec{F} = \langle y^2 \cos x, 5x + 2y \sin x \rangle$ and C is the triangle from (0, 0) to (2, 6) to (2, 0) to (0, 0). (10 points)

6) Evaluate I = $\iint_R \frac{x-y}{2x+y}dxdy$ by making a change of variables if R is bounded by $x-y=0$, $x-y=2$, $2x+y=2$, and $2x+y=6$ (15 points)

7) Find the mass of the part of the plane $x+y+z=4$ that lies above the triangle with vertices (0, 0), (1, 0), and (0, 2) if the density of the surface is $\rho(x,y,z)=x$ grams per square cm. (15 points)

8) **Verify Green's Theorem** if R is the region inside the rectangle [0, 2] x [0, 1] and if $\vec{F} = \langle xy, x^2 \rangle$.
(15 points)