Fall '10/MAT 309/Exam 4 **Name:** *Show all your work.*

1. (18pts) Find $\iint_D y\,dA$ if D is the region bounded by the lines $y = 0$, $y = x$ and $y = 6 - x$. Sketch the region of integration.

2. (18pts) Evaluate $\displaystyle\int_0^1 \int_{2y}^2 y e^{x^3}\,dx\,dy$ by changing the order of integration. Sketch the region of integration.

3. (16pts) Use polar coordinates to evaluate the integral $\displaystyle\int_0^5 \int_0^{\sqrt{25-x^2}} (x+y)\, dy\, dx$. Sketch the region of integration first.

4. (16pts) Sketch the region W given by $x^2+y^2+z^2 \leq 9$, $z \geq 2$, $y \geq 0$. Then write the two iterated triple integrals that stand for $\iiint_W f\, dV$ which end in $dz\, dy\, dx$, and $dy\, dx\, dz$.

5. (16pts) Use cylindrical coordinates to set up $\iiint_W \frac{xyz}{x^2+y^2+1}\,dV$ where W is the region above the cone $z = \frac{1}{2}\sqrt{x^2+y^2}$, under the plane $z = 10$ and between the planes $y = x$ and $y = 0$ $(x, y \geq 0)$. Sketch the region of integration. Do not evaluate the integral.

6. (16pts) Use change of variables to find the integral $\iint_D e^{x-y}\,dA$ if D is the rectangle bounded by $y = x$, $y = x - 4$, $y = -x$ and $y = 8 - x$. Sketch the region D.

Bonus. (10pts) Use spherical coordinates to find the volume of the region W from problem 4.