Math 2374 Worksheet 11

1. *Jacobians.* Compute the Jacobians of the following transformations. Which are appropriate change of variables?

a. $x = u^2 - v^2$, $y = u^2 + v^2$

b. $x = u/(u+v)$ $y = v/(u-v)$

c. $x = uv$, $y = vw$, $z = uw$.

2. *Transforming Regions.* What is the image of the triangle with vertices $(0,0)$, $(0,1)$, $(1,1)$ under the $x = u^2$, $y = v$?

3. *Change of Variables.* Integrate

$$\int\int_R \sqrt{x^2+y^2}\, dA$$

where R is the closed disc of radius 1, centered at $(0,0)$, by changing to polar coordinates.

4. *Change of Variables.* Integrate

$$\int\int_R x^2\, dA.$$

where R is the inside of the ellipse $9x^2 + 4y^2 = 36$, using the change of variables $x = 2u$, $y = 3v$.

5. *General Question.* What should you do when you are given a tranformation $u = f(x, y)$ and $v = g(x, y)$, instead of $x =$ and $y =$?

6. *Change of Variables.* Integrate

$$\int\int_R xy \, dA.$$

where R is bounded by $y = x$ $y = 3x$, $xy = 1$, $xy = 3$, $x > 0$, $y > 0$ using the change of variables $x = u/v$, $y = v$.

7. *Change of Variables.* Integrate

$$\int\int_R xy \, dA.$$

where R is bounded by $2x - y = 1$, $2x - y = 3$, $3x + y = 1$, $3x + y = -2$. (Find the correct change of variables.)

8. *Change of Variables.* Integrate

$$\int\int\int_S dV,$$

where S is bounded by $x^2/a^2 + y^2/b^2 + z^2/c^2 = 1$. (Find the correct change of variables.)