

PRINT Your Name: _____

Quiz 4, Spring, 2013

The quiz is worth 5 points. **Remove EVERYTHING** from your desk except **this quiz and a pen or pencil**. SHOW your work. Express your work in a neat and coherent manner.

Calculate $\iint_R \frac{1}{x+y} dx dy$, where R is the region bounded by $x = 0$, $y = 0$, $x + y = 1$, $x + y = 4$, by using the map $T(u, v) = (u - uv, uv)$.

$$(x, y) = (u - uv, uv)$$

so $x + y = u$

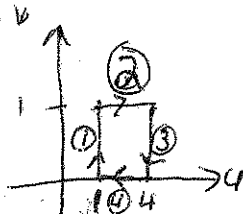
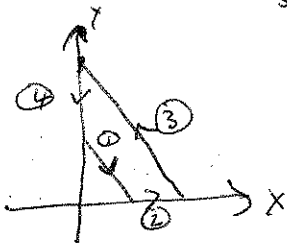
and $\frac{y}{x+y} = v$

$x + y = 1$ is sent to $u = 1$

$x + y = 4$ is sent to $u = 4$

$x = 0$ } is sent to $u(1-v) = 0$
 $1 \leq y \leq 4$ } $1 \leq uv \leq 4$
 so $u \neq 0$
 so $v = 1$

$y = 0$ } is sent to $uv = 0$
 $1 \leq x \leq 4$ } $1 \leq u(1-v) \leq 4$
 so $u \neq 0$
 so $v = 0$



$$\iint_R \frac{1}{x+y} dx dy = \iint_{T(R)} \frac{1}{u} du dv = \text{the area of } T(R) = \boxed{3}$$

$$J_{T^{-1}} = \begin{vmatrix} \frac{\partial x}{\partial u} & \frac{\partial x}{\partial v} \\ \frac{\partial y}{\partial u} & \frac{\partial y}{\partial v} \end{vmatrix} = \begin{vmatrix} 1-v & -v \\ v & u \end{vmatrix} = |u| = u$$