

Taker Name: **Key**

GTID: 90

Section:

Grader #1:

GTID: 90

PA#6A - §15.8: Change of variables

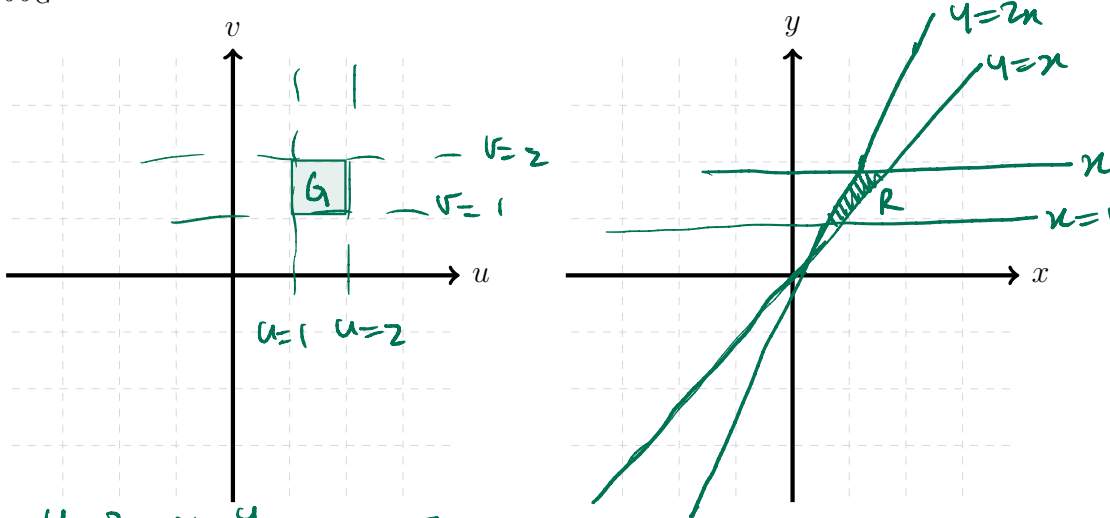
Let $u = x$ and $v = \frac{y}{x}$. Set up *but do NOT evaluate*

$$M = \iint_R \frac{x}{y} dA$$

for the region R bounded by the lines $y = x$, $y = 2x$, $x = 1$, $x = 2$. On the axes below, (a) sketch the new region of integration G after the change of variables and the original region R , (b) find the transformation $T(u, v) = (x, y)$, and (c) compute the Jacobian determinant $|\det DT(u, v)|$. Finally, (d) write the new iterated integral after the change of coordinates $\iint_G f(T(u, v)) |\det T(u, v)| du dv$.

A	
J	
N	
G2:	
A	
J	
N	
G3:	
A	
J	
N	

(a)



$$\begin{cases} y=2x \Rightarrow \frac{y}{x}=2 \Rightarrow v=2 \\ y=x \Rightarrow v=1 \\ x=1 \Rightarrow u=1 \\ x=2 \Rightarrow u=2 \end{cases}$$

$$(u, v) \in G = [1, 2] \times [1, 2]$$

(b)

$$\begin{cases} u=x \\ v=\frac{y}{x} \end{cases} \Rightarrow \begin{cases} x=u \\ y=uv \end{cases}$$

$$T(u, v) = \begin{bmatrix} u \\ uv \end{bmatrix}$$

$$(c) \quad DT = \begin{bmatrix} 1 & 0 \\ v & u \end{bmatrix} \quad \det DT = u$$

$$|\det DT| = |u|$$

(d)

$$M = \int_1^2 \int_1^2 \frac{1}{v} * u \, du \, dv$$