

Recorder: \_\_\_\_\_

Task Master: \_\_\_\_\_ Cynic: \_\_\_\_\_ Other: \_\_\_\_\_

## CHANGE OF VARIABLES

Working in small groups (3 or 4 people), solve as many of the problems below as possible. Try to resolve questions within the group before asking for help. The Recorder is responsible for writing up the group's results and turning it in. Show your work! Full credit will only be given if your answer is supported by calculations and/or explanations as appropriate.

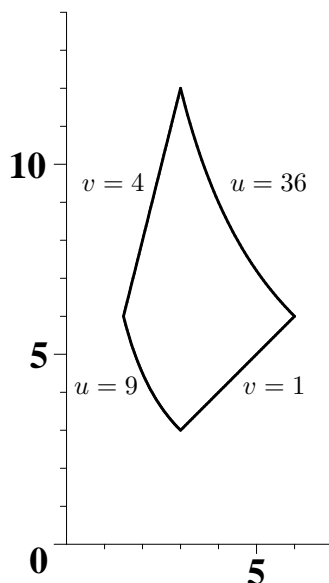
1. Consider the region  $D$  in the  $xy$ -plane shown below, which is bounded by

$$u = 9 \quad u = 36 \quad v = 1 \quad v = 4$$

where

$$u = xy \quad v = \frac{y}{x}$$

If you want to determine  $x$  and  $y$  as functions of  $u$  and  $v$ , consider  $uv$  and  $u/v$ .



- (a) List as many methods as you can think of for finding the area of the given region.  
*It is enough to refer to the methods by name or describe them briefly.*
- (b) For at least 3 of these methods, give explicitly the formulas you would use to find the area.  
*You must put limits on your integrals, but you do not need to evaluate them.*
- (c) Using any 2 of these methods, find the area.  
*One of these should be a method we have learned recently.*
2. Now consider the following integral over the same region  $D$ :  $\iint_D \frac{y}{x} dA$
- (a) Which of the above methods can you use to do this integral?
- (b) Do the integral.