Math 300A Quiz 3

NAME ____

Problem 1: Let S = {1, 2, 3, 4, 5}. Two functions f and g from S to S are defined by these elements of S x S:

f = {(1, 2), (2, 3), (3, 2), (4, 4), (5, 3)}

g = {(1, 1), (2, 5), (3, 2), (4, 3), (5, 4)}

Fill in the blanks below.

(a)

$f \circ g\ (1)$ = _____, $f \circ g\ (2)$ = ______, $f \circ g\ (3)$ = ______, $f \circ g\ (4)$ = _____, $f \circ g\ (5)$ = _____

(b)

$(f \circ g)^{-1}$ {3, 5} = ______________________

(c)

Image of $f \circ g$ = { ________________ }

(d)

f({1, 2, 3}) = { ____________________ }

Problem 2: A *permutation* of a set U is defined to be a function from U to U that is a 1-1 and onto. Suppose that μ is some permutation of U.

Use μ to define a relation on U: for $x \in U$ and $y \in U$, we say $x \ R_{\mu} \ y$ if $y = \mu^n x$ for some ***positive integer n***. Which of the following statements are true? If not true, explain why. If true, prove the statement.

(a) For any permutation μ of U, the relation R_{μ} is reflexive.

(b) For any permutation μ of U, the relation R_{μ} is symmetric.

(c) For any permutation μ of U, the relation R_{μ} is transitive.

(d) For any permutation μ of U, the relation R_{μ} is an equivalence relation.