Answer:

7. **(10 points)** Let A={1, 2, 3, 4}, and R={(1, 4), (3, 1), (3, 2), (3, 3), (4, 2)}
   (a) Show the corresponding matrix M_R and draw the digraph of R;
   (b) Compute the matrix of R^2;
   (c) Compute the matrix of the transitive closure of R.
   Answer:

8. **(10 points)** Let S = {1, 2, 3, 4, 5} and A=S×S. Define the following relation R on A: (a, b) R (a', b') if and only if b=b'.
   (a) Show that R is an equivalence relation
   (b) Compute A/R and |A/R|.
   Answer:

9. **(10 points)** Let A={1, 2, 3, 4, 5, 6} and $p = \begin{pmatrix} 1\,2\,3\,4\,5\,6 \\ 3\,1\,2\,5\,4\,6 \end{pmatrix}$ be a permutation of A, i.e. a bijection from A to A: p(1) = 3, p(2) = 1, p(2) = 2, ..., p(6) = 6
   (a) Compute p^{-1} and $p^2 = p \circ p$, and write them in the form above.
   (b) Is it possible that p^n is the identitv function for some n? If yes, why and what is such a possible integer? If not, why?
   Answer:

10. **(10 points)** Let f: A->B and g: B ->C be two functions that are everywhere defined. Prove
   (a) If f and g are surjections, then g∘f is a surjection from A to C.
   (b) If g∘f is surjective(onto), then g is surjective.
   (c) Disprove that the following proposition: If g∘f is surjective, then f is surjective.
   Answer: