

Homework 5, Math 189, Fall 2023

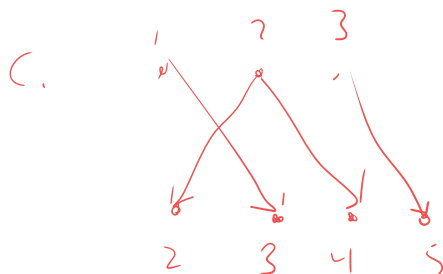
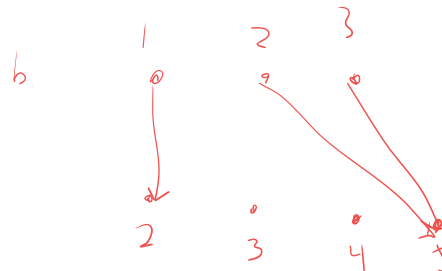
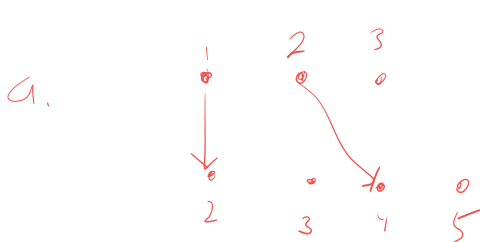
Dr Holmes

September 19, 2023

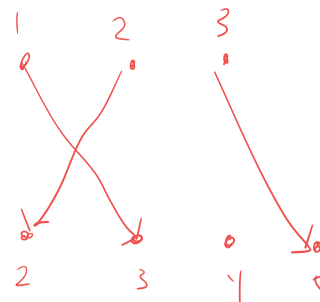
This assignment is based on Levin's 0.4 exercises, and I may refer to exercises in that set in connection with these, which you are welcome to look at (he has solutions to most of his). Interactive examples in the section also might be helpful.

1. based on example 0.4.3

Let $A = \{1, 2, 3\}$ and $B = \{2, 3, 4, 5\}$. Some arrow diagrams are given. Tell me which diagrams are diagrams of functions from A to B . Of the functions, tell me which ones are injective. Why don't I ask which ones are surjective? When you say that something is not a function, or that a function is not injective, give a brief reason.



1



2. based on 0.4 problem 2

The following functions each have domain and codomain $\{1, 2, 3, 4\}$. For each one, say whether it is injective, surjective, neither, or both. If it is both, please write out its inverse function in the same format.

(a)

$$\begin{pmatrix} 1 & 2 & 3 & 4 \\ 2 & 1 & 4 & 3 \end{pmatrix}$$

(b)

$$\begin{pmatrix} 1 & 2 & 3 & 4 \\ 2 & 2 & 1 & 1 \end{pmatrix}$$

(c)

$$\begin{pmatrix} 1 & 2 & 3 & 4 \\ 4 & 3 & 2 & 1 \end{pmatrix}$$

(d)

$$\begin{pmatrix} 1 & 2 & 3 & 4 \\ 3 & 3 & 3 & 3 \end{pmatrix}$$

3. Do problem 5 and problem 6 in section 0.4 (I know problem 5 has a solution, so you can check your work on that part). In problem 5, where you have answers, also write three of the functions as triples in the style of the set theory notes.

4. Based on example 0.4.8

~~5.~~

$$\begin{pmatrix} 1 & 2 & 3 & 4 & 5 \\ a & b & c & a & e \end{pmatrix}$$

is a function f with codomain $\{a, b, c, d, e\}$

Compute the following

(a) $f(4)$

(b) $f[\{1, 2, 4\}]$

(c) $f^{-1}[\{a, c\}]$

(d) $f^{-1}[\{d\}]$