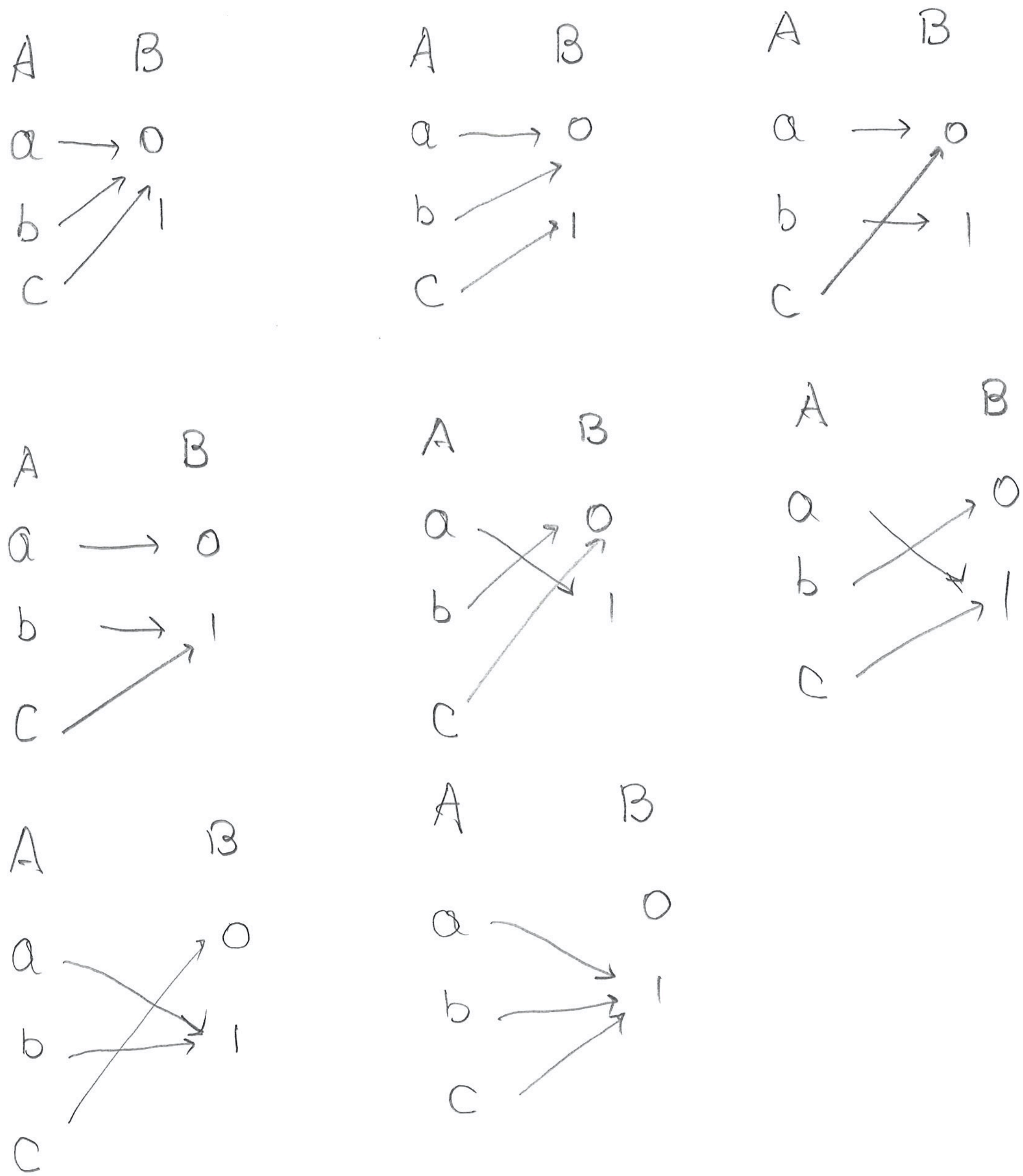
CSCI 2112 ASSIGNMENT 5 Chaojun Ma

1a: $2^{|A|\,|B|} = 2^{3\times 2} = 2^6 = 64$

1b:



2a: No, according to the define, injective is one to one

Since $f(0,0) = f(1,1) = 0$. $f(0) = f(1) = 0$. $0 \neq 1$

2b: Proof: $f: \{0,1\} \times \mathbb{N} \to \mathbb{Z}$.

$a = 0$, $f(a,b) = b$, $b \in \mathbb{N}$, $f(a,b) \in \mathbb{N}$

$a = 1$. $f(a,b) = 1 - b$, $b \in \mathbb{N}$. $f(a,b) \in (-\infty, 1]$

2c: Not bijective, because f is not injective.

3a: functions missing elements. $C_5^1 4^6 - C_5^2 3^6 + C_5^3 2^6 - C_5^4 1^6$.

Means missing 1, 2, 3, 4 elements respectiely.

3b: $f = \{(a, f(a)), (b, f(b)), (c, f(c)), (d, f(d)), (e, f(e)), (f, f(f))\} \Rightarrow 5 \times 5 \times 5 \times 5 \times 5$.

3c: $\cancel{f = \{(}$ $\{(a, f(a)), (b, f(b)), (C, f(c))\} = C_3^2 \times C_5^1 \times C_4^1 = 60$.

remain $(d, f(d)), (e, f(e)), (f, f(f))$ have $5 \times 5 \times 5$

Therefore. $f = \{(a, f(a)), (b, f(b)), (c, f(c)), (d, f(d)), (e, f(e)), (f, f(f))\} = 4500$

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4. f is symmetric so $f = f^{-1}$

$\forall a \in A\ f(a) = b \Rightarrow f(b) = a$. $b \in A$. $f(b) = a$.

f is symmetric.

$f = f^{-1}$, f is symmetric.

$\forall a, b \in A$, $f(a) = b$, $f^{-1}(b) = b$.

$f^{-1}(b) = a$. $f(b) = a$.

$\forall a. b \in A\ f(a) = b \Rightarrow f(b) = a$. f is symmetric.

5 a: $f = \{(0,0), (1,0), (2,1)\}$. if $w = \{0,2\}$. $x = \{1\}$

$A = \{0,1,2\}$. $B = \{0,1\}$. $f(w) = \{0\}$, $f(x) = \{0\}$.

Since we have: $f(w) \cap f(x) = \{0\}$.

$f(w \cap x) = \emptyset$.

5b: $f(f^{-1}(Y_1)) = Y \Rightarrow f$ is surjective.

Proof by Contradiction.

Cont'd

Assume f is not surjective. domain of f is X.

~~te~~ Since at least one $y \in Y$. such that $\forall x \in X$ $f(x) \neq y$

Then $f^{-1}(y)$ is not defined, Contradiction.

Thus $f(f^{-1}(Y)) = Y \Rightarrow f$ is surjective.

f is surjective $\Rightarrow f(f^{-1}(Y)) = Y$.

Assume domain of f is X.

f is surjective. $f(x) = Y$. $f^{-1}(Y) = X$.

$\Rightarrow f(f^{-1}(Y)) = f(x) = Y$.

D.

6. meet the requirements.

7. finished, the Survey. and Study the info sheet about final.