(1)
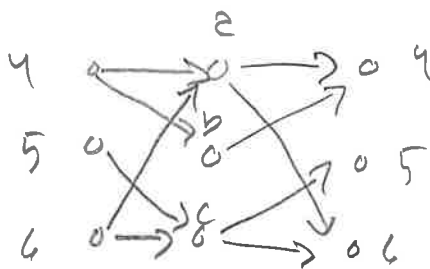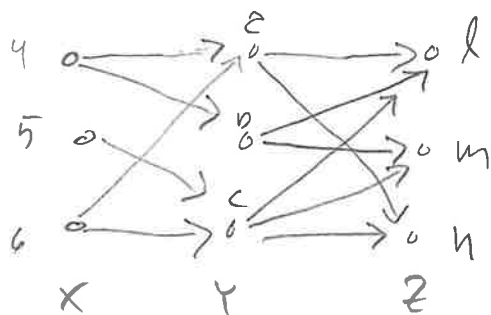

$$R \circ S = \{ (4,l), (4,m), (4,n), (5,l), (5,m), (5,n),$$
$$(6,l), (6,m), (6,n) \} = \underline{X \times Z}$$

$$R^{-1} = \{ (e,4), (b,4), (c,5), (e,6), (c,6) \}$$

$$R \circ R^{-1} = \{ (4,4), (4,6), (5,5), (5,6), (6,4), (6,5), (6,6) \}$$

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(2) a) $T = \{ (x, x^2) \mid x \in \mathbb{R}^+ \}$

$\quad\quad T^{-1} = \{ (x, \sqrt{x}) \mid x \in \mathbb{R}^+ \}$

b) $S = \{ (x, 3x-1) \mid x \in \mathbb{R} \}$

$\quad\quad S^{-1} = \{ (x, \frac{(x+1)}{3}) \mid x \in \mathbb{R} \}$

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(3) a) $G = P \circ P$

b) $S = P^{-1} \circ P$

c) $C = P^{-1} \circ P^{-1} \circ P \circ P$

④ Let $a \in A$ and $b \in B$. Then,

$$(a,b) \in (R \cup S)^{-1} \iff (b,a) \in (R \cup S) \iff (b,a) \in R \text{ or } (b,a) \in S$$
$$\iff (a,b) \in R^{-1} \text{ or } (a,b) \in S^{-1} \iff (a,b) \in R^{-1} \cup S^{-1}.$$

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⑤ a)

P	Q	P∨Q	P⟹Q	¬P⟹Q
F	F	F	T	F
T	F	T	F	T
F	T	T	T	T
T	T	T	T	T

b)

P	Q	P∨Q	P∧Q	¬(P∨Q)	¬(¬P∨¬P)
F	F	F	F	T	F
F	T	T	F	F	F
T	F	T	F	F	F
T	T	T	T	F	T

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⑥

P	Q	(P⟹Q)	P∨Q	(P⟹Q)⟹Q
F	F	T	F	F
T	F	F	T	T
F	T	T	T	T
T	T	T	T	T