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a) $\emptyset \subseteq \emptyset$ $\boxed{\text{True}}$

b) $\emptyset \in \emptyset$ $\boxed{\text{False}}$

c) $\emptyset \in \{\emptyset\}$ $\boxed{\text{True}}$

d) $\emptyset \subseteq \{\emptyset\}$ $\boxed{\text{True}}$

e) $\{a,b\} \in \{a,b,c,\{a,b\}\}$ $\boxed{\text{True}}$

f) $\{a,b\} \subseteq \{a,b,\{a,b\}\}$ $\boxed{\text{True}}$

g) $\{a,b\} \subseteq 2^{\{a,b,\{a,b\}\}}$ $\boxed{\text{True}}$

h) $\{\{a,b\}\} \in 2^{\{a,b,\{a,b\}\}}$ $\boxed{\text{True}}$

i) $\{a,b,\{a,b\}\} - \{a,b\} = \{a,b\}$ $\boxed{\text{False}}$ $\{\{a,b\}\}$ olmalı

$\boxed{1.1.2}$

a) $(\{1,3,5\} \cup \{3,1\}) \cap \{3,5,7\}$

$= \{1,3,5\} \cap \{3,5,7\} = \boxed{\{3,5\}}$

b) $\bigcup\{\{3\},\{3,5\},\bigcap\{\{5,7\},\{7,9\}\}\}$

$= \bigcup\{\{3,\},\{3,5\},\{7,\}\} = \boxed{\{3,5,7\}}$

c) $(\{1,2,5\} - \{5,7,9\}) \cup (\{5,7,9\} - \{1,2,5\})$

$= \{1,2\} \cup \{7,9\} = \boxed{\{1,2,7,9\}}$

d) $2^{\{7,8,9\}} - 2^{\{7,9\}}$

$= \{\emptyset, \{7\}, \{8\}, \{9\}, \{7,8\}, \{7,9\}, \{8,9\}, \{7,8,9\}\}$
$- \{\emptyset, \{7\}, \{9\}, \{7,9\}\}$

$= \boxed{\{8\}, \{7,8\}, \{8,9\}, \{7,8,9\}}$

e) $2^{\emptyset} = \boxed{\{\emptyset\}}$

1.1.3

a) $A \cup (B \cap C) = (B \cap C) \cup A$ commutativity

$= (B \cup A) \cap (C \cup A)$ distributivity

$= (A \cup B) \cap (A \cup C)$ commutativity

b) $A \cap (B \cup C) = (A \cap B) \cup (A \cap C)$ distributivity

c) $A \cap (A \cup B) = A$ absorption

d) $A \cup (A \cap B) = A$ absorption

e) $A - (B \cap C) = (A - B) \cup (A - C)$ DeMorgan

1.1.4

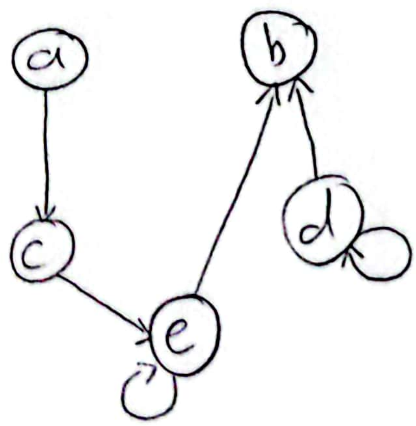
a) en az : $\{a,b,c,d\}$

en çok : $\{a\},\{b\},\{c\},\{d\}$

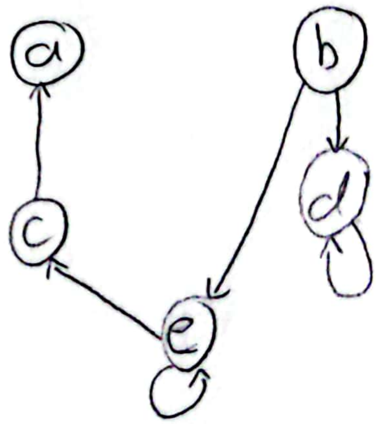
b) $\{a,b,c\},\{d\}$ / $\{a,b,d\},\{c\}$ / $\{a,c,d\},\{b\}$ / $\{b,c,d\},\{a\}$ / $\{a,b\},\{c,d\}$ / $\{a,c\},\{b,d\}$ / $\{a,d\},\{b,c\}$

1.3.1

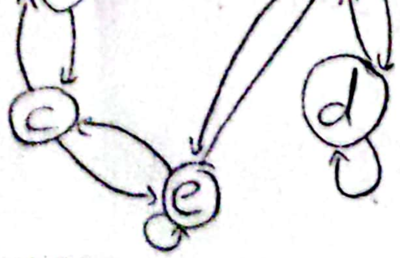
a) R



b) R^{-1}



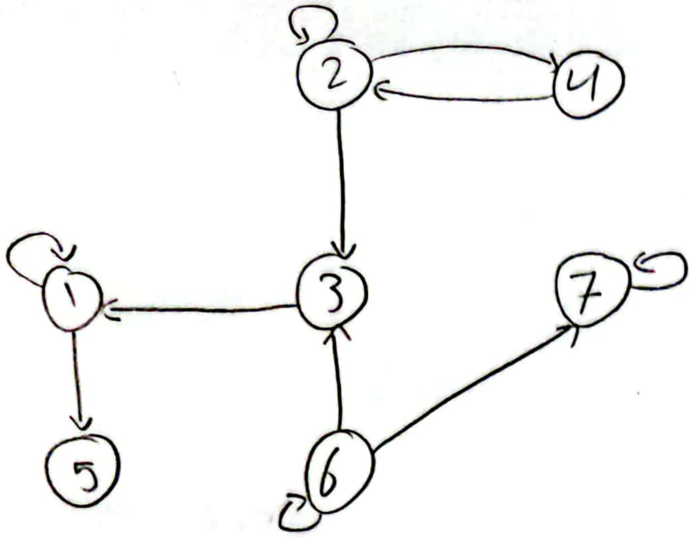
c) $R \cup R^{-1}$



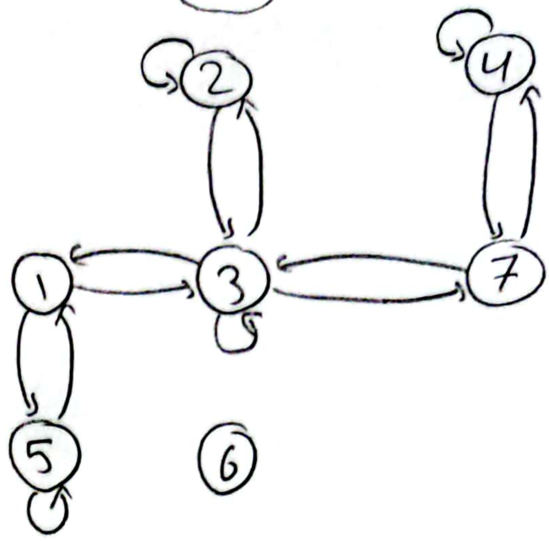
d) $R \cap R^{-1}$

1.3.2

R



S

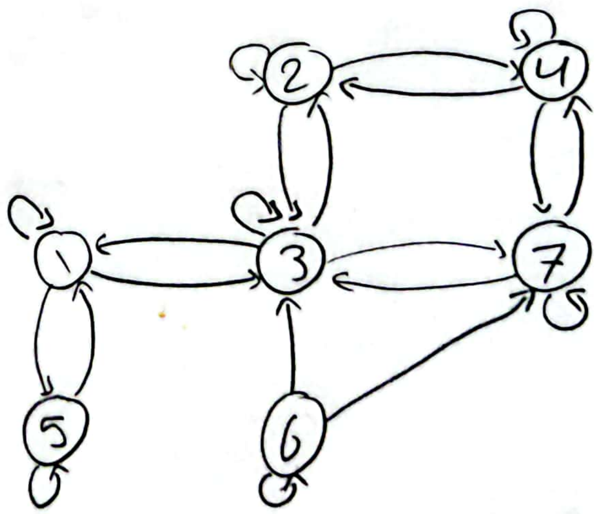


a) R: Symmetric değil, Reflexive değil, Transitive değil.

S: Symmetric'tir, Reflexive değil, Transitive değil.

b) Symmetric değil, Reflexive'tir, Transitive değil.

$R \cup S$



1.3.4

Symmetry + Antisymmetry + Transitivity.

1.3.7

- $\forall a \in A$, (a,a) hem R_1'de hem de R_2'de olması gerektiğinden dolayı, $(a,a) \in R_1 \cap R_2 \Rightarrow R_1 \cap R_2$ Reflexive.

- $(a,b) \in R_1 \cap R_2$ ve $(b,a) \in R_1 \cap R_2$ ise, $a=b$ olmalıdır. Çünkü bu özellik R_1 ve R_2'de sağlanır, o zaman $R_1 \cap R_2$'de de sağlanır. $\Rightarrow R_1 \cap R_2$ Antisymmetric.

- Transitivity özelliğinin hem R_1 hem de R_2 için geçerli olduğunu bildiğimiz için, $(a,c) \in R_1 \cap R_2$ durumunu olmadan $(a,b) \in R_1 \cap R_2$ ve $(b,c) \in R_1 \cap R_2$ olmak üzere iki eleman olamaz. $\Rightarrow R_1 \cap R_2$ Transitive.

$\Rightarrow R_1 \cap R_2$ partial order'dır.

1.3.9

Directed graph'ta her düğümden tek bir kenar çıkıyorsa bir fonksiyon temsil eder.