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COMPUTER SCIENCE

CMP 215

Assignment

2. Prove the following

a $S \cup (S \cap T) = S \cap (S \cup T) = S$

solution

$S = \{2, 4, 6, 8, 10\}$

$T = \{2, 3, 4, 5\}$

$S \cap T = \{2, 4\}$

$S \cup T = \{2, 3, 4, 5, 6, 8, 10\}$

$S \cup (S \cap T) = \{2, 4, 6, 8, 10\}$

$S \cap (S \cup T) = \{2, 4, 6, 8, 10\}$

Proved = $S \cup (S \cap T) = S \cap (S \cup T) = S$

b $S \subseteq T$ if and only if $S \cup T = T$

$S = \{1, 2, 3\}$

$T = \{1, 2, 3, 4, 5, 6\}$

$S \subseteq T = \{1, 2, 3\}$

$S \cup T = \{1, 2, 3, 4, 5, 6\}$

Proved = $S \cup T = T$

c If $R \subseteq T$ and $S \subseteq T$ then $R \cup S \subseteq T$

$R = \{a, b\}$

$R \cup S = \{a, b, c, d\}$

$S = \{c, d\}$

$T = \{a, b, c, d, e, f\}$

$R \subseteq T = \{a, b\}$

$S \subseteq T = \{c, d\}$

Proved = $R \cup S \subseteq T$

d If $R \subseteq S$ and $R \subseteq T$ the $R \subseteq S \cap T$

$R = \{a, b\}$

$S = \{a, b, c\}$

$T = \{a, b, c, d\}$

$R \subseteq S = \{a, b\}$

$R \subseteq T = \{a, b\}$

$S \cap T = \{a, b, c\}$

Proved = $R \subseteq S \cap T$ //

e If $S \subseteq T$ then $R \cup S \subseteq R \cup T$ and $R \cap S \subseteq R \cap T$

$S = \{2, 3\}$

$T = \{4, 2, 3\}$

$R = \{1, 2, 3\}$

$S \subseteq T = \{2, 3\}$

$R \cup S = \{1, 2, 3\}$

$R \cup T = \{1, 2, 3, 4\}$

$R \cap S = \{2, 3\}$

$R \cap T = \{2, 3\}$

Proved = $R \cup S \subseteq R \cup T$ and $R \cap S \subseteq R \cap T$

f If $S \cup T \neq \emptyset$ then either $S \neq \emptyset$ or $T \neq \emptyset$

$S = \{a, b\}$

$T = \{\ \}$

$S \cup T = \{a, b\}$

Proved: $S \cup T \neq \emptyset$ $S \neq \emptyset$ but $T = \emptyset$

g If $S \cap T \neq \emptyset$ then both $S \neq \emptyset$ and $T \neq \emptyset$

$S = \{1, 2, 3, 4\}$

$T = \{2, 4, 6, 8\}$

$S \cap T = \{2, 4\}$

Proved: $S \cap T \neq \emptyset$ and both $S \neq \emptyset$ and $T \neq \emptyset$

h $S = T$ if and only if $S \cup T = S \cap T$

$S = \{a, b, c\}$

$T = \{a, c, b\}$

$S \cup T = \{a, b, c\}$

$S \cap T = \{a, b, c\}$

Proved: $S = T$ and $S \cup T = S \cap T$