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CprE 310 HW4

HW 4

1) Prove $A \cup (B \cap C) = (A \cup B) \cap (A \cup C)$ ->

$x \in A \cup (B \cap C) \Rightarrow x \in A$ or $x \in (B \cap C) \Rightarrow$
$x \in A$ or ($x \in B$ and $x \in C$) $\Rightarrow x \in (A$ or $B)$ and $x \in (A$ or $C) \Rightarrow$
$x \in (A \cup B)$ and $x \in (A \cup C) \Rightarrow x \in (A \cup B) \cap (A \cup C)$

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2) One-to-One? No, $F(-2,-2) = F(2,2) = 4$
Onto? Yes, $F(1,n) = n$

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3) a) if F is a surjection, $y \in Y$ and $x \in X$, that $F(x) = y$
As g is also a surjection, For every $z \in Z$ there exists a $y \in Y$ that $g(y) = z$; As there are any possible y, there are any possible z.

b) We have found that h is surjective, testing for injective -

As g & F are injective, $g(F(a)) = g(F(a')) \Rightarrow$
$F(a) = F(a') \Rightarrow a = a'$

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4) a) The graph cannot have cycles of size 1, as a player cannot beat themselves. Cycles of size 2 are also impossible, as a player cannot beat and be beaten by the same player.

b) i. Never asymmetric, neither cycles of size 1 nor 2 are allowed
ii. Never reflexive, a player cannot beat themselves
iii. Always irreflexive, no loops of size 1
iv. Never transitive, if player 2 beats player 3, and player 1 beats player 2, it does not guarantee that player 1 beats player 3

5) a) - Reflexive: w_1 and w_1 have the same first letter: the(0) = the(0) ✓

- Symmetric: The order does not matter, $w_1(0) = w_2(0) \equiv w_2(0) = w_1(0)$

the (0) = that (0) ≡ that (0) = the (0) ✓

- Transitive: the (0) = that (0)   that (0) = this (0)   the (0) = this (0) ✓

As all three conditions are met, the relation is equivalent.

b) [The] = [the] = [the] E [television] = [tuned] = [to] | [above] = [a]

[color] = [channel]