

Practice Submission Prior to Assignment

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Question 1:

From Rosen, Discrete Mathematics and its Applications: When three professors are seated in a restaurant, the hostess asks them: "Does everyone want coffee?" The first professor says: "I do not know." The second professor then says: "I do not know." Finally, the third professor says: "No, not everyone wants coffee." The hostess comes back and gives coffee to the professors who want it. How did she figure out who wanted coffee?

Answer:

The question is : "Does everyone want coffee?" . For the first professor, he wants a coffee because if he doesn't want a coffee, his answer to the question should be "no". Similar to the second professor, he wants a coffee too. For the third professor, he knows that the first two professors want coffee and his answer is "no, not everyone wants coffee", which mean he doesn't want coffee. In conclusion, the first two professors want coffee.

Question 2:

This problem is adapted from Problem 4, page 10 of the Liebeck text. Start with the statement $A \rightarrow B$. Which of the following statements does this statement imply? You should be able to explain your answers using

ordinary language.

(a) A is true or B is true

(b) $\bar{A} \rightarrow B$

(c) $B \rightarrow A$

(d) $\bar{B} \rightarrow A$

(e) $\bar{A} \rightarrow \bar{B}$

(f) $\bar{B} \rightarrow \bar{A}$

Answer:

The statement $A \rightarrow B$ means A implies B.

This statement is false if and only if A is true and B is false.

Look at these given statements we can see statement (f) is the best choice because (f) is false if and only if negation of B is true and negation of A is false which means B is false and A is true.

Therefore, statement (f) $\bar{B} \rightarrow \bar{A}$ is equivalent to statement $A \rightarrow B$

Definitions

今也，南蠻馮舌之人，非先王之道。

——《孟子·滕文公上》

Consider the old siumatgwoon axioms, and a new relation "synonym", represented by \sim , read as "is synonymous with". It satisfies the following axioms.

S1. (reflexivity) for all $x \in S$, $x \sim x$. S2. (symmetry) For all, $a, b \in S$, if $a \sim b$ then $b \sim a$. S3. (transitivity) for all $a, b, c \in S$, if $a \sim b$, and $b \sim c$, then $a \sim c$.

S4. (Compositional congruence) If $a \sim a'$, then (if they ax or xa exists):

- $ax \sim a'x$, - $xa \sim xa'$

S5. Composition cancellation

- If $a * b \sim a * c$, then $b \sim c$; - If $b * a \sim c * a$ then $b \sim c$;

S6. Divisier compatibility: If $a \sim b$, then for all $x \in S$, $x|a$ iff $x|b$.

S7: Upwards divisibility : If $a|b$, then for all if $a|x$ then $b|x$.

A Siumatgwoon is Synonym-Closed if in which if $a*b$ exists and $a \sim a'$ and $b \sim b'$ then $a' * b, a * b', a' * b'$ also exist. Most siumatgwoons, including the Sinoglyphs, are not synonym-closed.

Because of S4, Synonym-Closed Siumatgwoons must have $a * b \sim a' * b \sim a * b' \sim a' * b'$.