CSE 280 Challenge Set 01

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Question 1

Let the following statements by given:

- $a =$ "You used the pool in the afternoon."
- $b =$ "You cleaned up after lunch."
- $c =$ "You must clean up after dinner."

Part 1

Use connectives (operators) to translate the following statement into a compound proposition.

"If you used the pool in the afternoon and you didn't clean up after lunch, then you must clean up after dinner."

Part 2

Construct a truth table for the compound proposition you found in Part 1. The eight rows of your table should correspond to the eight different possibilities for a, b, and c.

Row	a	b	c	$\neg b$	$a \wedge \neg b$	ANS
1						
2						
3						
4						
5						
6						
7						
8						

Part 3

Suppose that the compound proposition given in part 1 is false. What must be true about your pool usage and cleanup duties?

Question 2

Use a truth table to prove that the compound proposition $[(p \vee r) \wedge (\neg p)] \rightarrow r$ is always true or always false, no matter what p and r are. What do we call this type of compound proposition?

Question 3

Let s be the following statement: "If it's raining, then the ground is wet."

Part 1

Give the inverse of s. Is this the same as s?

Part 2

Give the converse of s. Is this the same as s?

Part 3

Give the contrapositive of s. Is this the same as s?

Question 4

Determine if the following propositions written in English are True or False:

- If 2 is even, then 5 is prime.
- If 3 is even, then 6 is prime.
- If 5 is odd, then 8 is prime.
- If 8 is odd, then 11 is prime.
- 10 is even if and only if 4 is prime
- 11 is even if and only if 6 is prime

Question 5

Simplify the following using a truth table:

$\neg(A \rightarrow B) \vee \neg(A \vee B)$

Question 6

The following "ugly-looking" multi-line compound proposition is a Tautology. Can you explain why without using a truth table. Hint: Refer back to Question 3 above.

$((A \rightarrow B) \leftrightarrow (\neg B \rightarrow \neg A)) \wedge ((B \rightarrow A) \leftrightarrow (\neg A \rightarrow \neg B)) \wedge$

$((B \rightarrow C) \leftrightarrow (\neg C \rightarrow \neg B)) \wedge ((C \rightarrow B) \leftrightarrow (\neg B \rightarrow \neg C)) \wedge$

$((A \rightarrow C) \leftrightarrow (\neg C \rightarrow \neg A)) \wedge ((C \rightarrow A) \leftrightarrow (\neg A \rightarrow \neg C))$