

**Foam Test 1 Review: first study quizzes!**

(1) Finish the following truth table. Is the last expression a tautology, contradiction or neither?

$P$	$Q$	$\sim Q$	$P \Rightarrow Q$	$P \vee \sim Q$	$(P \Rightarrow Q) \wedge (P \vee \sim Q)$
T	T				
T	F				
F	T				
F	F				

(2) Suppose that  $P$  is false and  $Q$  is true. Find whether each of these statements is true (T) or false (F).

- $(P \Rightarrow \sim Q) \Rightarrow Q$
- $(P \wedge (Q \iff (\sim P))) \vee Q$
- Repeat the above problems with the alternate given information that  $P$  is false and  $Q$  is false.
- $(P \Rightarrow \sim Q) \Rightarrow Q$
- $(P \wedge (Q \iff (\sim P))) \vee Q$

(3) Given the statement of implication “ $(x \in \mathcal{S} \text{ and } x \leq 5)$  implies that  $(x > 2 \text{ or } x = -10.)$ ”

- Find its converse; write it without the word “not” and without the symbol “ $\sim$ .”
- Find its negation; write it without the word “not” and without the symbol “ $\sim$ .”
- Find its contrapositive; write it without the word “not” and without the symbol “ $\sim$ .”
- Find its inverse; write it without the word “not” and without the symbol “ $\sim$ .”
- If  $\mathcal{S} = \{3, 4, 7, 11\}$ , is the statement true or false for all  $x \in \mathcal{S}$ ?

(4) Given the statement:  $\forall x \in \mathbb{Z}, (x \text{ even or } x|18) \Rightarrow ((x+1) \text{ is odd and } x^2 > 3)$ .

- Find its negation; write it without the symbol “ $\sim$ .”

- Find a counterexample which proves the original statement is false.

(5) Given the statement:  $\forall x \in \mathbb{R}, \exists y \in \mathbb{Z} \text{ s.t. } yx \leq (yx + x)$ .

- Find its negation; write it without the symbol “ $\sim$ .”

(6) Given the statement: If you have a french-apple pie then you have raisins, cherries and a glazed crust.

- Find its contrapositive; write it without the symbol “ $\sim$ .”

- Find its converse; write it without the symbol “ $\sim$ .”

- Rewrite the statement using the words “only if.”

- Rewrite the statement using the word “necessary.”

- Rewrite the statement using the word “sufficient.”

(7) Given universe  $\mathcal{U} = \{1, 2, 3, 4, 5, 7, 9, 10, 21, 25\}$  ;  $A = \{7, 9, 10, 21, 25\}$ ;  
and  $B = \{5, 4, 7, 10, 21\}$ . Find the following:

- $\overline{A \cup B}$
- $(A - B) \cup (B - A)$
- $\overline{(B - A) \cap A}$
- $|\mathcal{P}(A)|$
- $|\mathcal{P}(A \times B) \times A|$
- $A \cap \overline{A}$
- $\mathcal{U} - \overline{B}$

(8) Given  $A = \{4, \{5, 7\}, 7, \{7\}, \{\{5\}, 7\}\}$ .

- Find  $|A|$

True or False?

- $\{\{5\}\} \in A$ .
- $\{5\} \in A$ .
- $5 \subseteq A$ .
- $5 \in A$ .
- $7 \in A$ .
- $\{5, 7\} \in A$ .
- $\{7\} \in A$ .
- $\{7\} \subseteq A$ .
- $\{\{7\}, 7\} \subseteq A$ .
- $\{\} \in A$ .
- $\{\} \subseteq A$ .