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Chapter 2 Problem set

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1. Write the negation of each following statements.
   a. None of the students have stable connection for their online class.
   b. Some students prefer face to face classes.
   c. If 2 is odd then 2n is also odd.
   d. Some prime numbers are even.

2. Consider the following propositions
   p: 5 is a prime number
   q: 8 is not divisible by 3

   a. $\sim p \wedge q$
      - 5 is not a prime number and 8 is not divisible by 3.
   b. $p \Rightarrow \sim q$
      - If 5 is a prime number then 8 is divisible by 3.
   c. $q \Leftrightarrow p$
      - 5 is a prime number if and only if 8 is not divisible by 3.

3. If p, q and r denote the following propositions.
   a. $\sim p \Rightarrow q$
   b. $(p \vee \sim q) \Leftrightarrow \sim p$
   c. $(r \wedge \sim p) \Rightarrow q$

4. Write the converse, inverse and contrapositive of the statement.

   Converse - If it is divisible by 2 then 6 is an even number.
   Inverse - If 6 is an odd number then it is not divisible by 2.
   Contrapositive - If it is not divisible by 2 then 6 is an odd number.

5. Draw a truth table and determine for what truth values of p and q the proposition $\sim p \vee q$ is false.

p	q	$\sim p$	$\sim p \vee q$
T	T	F	T
T	F	F	F
F	T	T	T
F	F	T	T

6. Construct truth tables

a. $(\sim p \wedge q) \Rightarrow r$

p	q	r	$\sim p$	$\sim p \wedge q$	$\sim p \wedge q \Rightarrow r$
T	T	T	F	F	T
T	T	F	F	F	T
T	F	T	F	F	T
T	F	F	F	F	T
F	T	T	T	T	T
F	T	F	T	T	F
F	F	T	T	F	T
F	F	F	T	F	T

b. $p \vee (q \wedge r) \Leftrightarrow \sim q$

p	q	r	$q \wedge r$	$p \wedge q \wedge r$	$\sim q$	$p \vee (q \wedge r) \Leftrightarrow \sim q$
T	T	T	T	T	F	F
T	T	F	F	T	F	F
T	F	T	F	T	T	T
T	F	F	F	T	T	T
F	T	T	T	T	F	F
F	T	F	F	F	F	T
F	F	T	F	F	T	F
F	F	F	F	F	T	F