Section 2: Switching between Logic and Sets (Chapter 3.4)

Logic, Sets, and Boolean algebra are related and can be interchanged. We end up transitioning from Logic and Sets to Boolean algebra, which is written in a more algebraic style (duh) in order to discover new properties of systems.

You can interchange between Logic and Sets by swapping the following elements:

A, B, C, $\leftrightarrow$ p, q, r	$= \leftrightarrow \equiv$	
$\cap \leftrightarrow \wedge$	$\cup \leftrightarrow \vee$	$' \leftrightarrow \neg$
U $\leftrightarrow$ t	$\emptyset \leftrightarrow$ c	

1. Convert the following set theory expressions to logical notation, using p, q, and r:

a. $(A \cup B) \cap (C' \cup U)$ **(___/1)**

b. $(A \cap B') \cup \emptyset = (A' \cup B)'$ **(___/1)**

2. Convert the following logical expressions to set notation, using A and B as sets:

a. $(\neg(p \vee c) \wedge (\neg q \wedge t)) \vee p$ **(___/1)**

b. $(\neg p \vee c) \wedge \neg(q \vee r) = \neg p \wedge \neg q \wedge \neg r$ **(___/1)**

Section 2: Boolean Algebra (Chapter 3.4)

Boolean Algebra is also related to Logic and Sets:

	Logical	Sets	Boolean Algebra
Variables	p,q,r	A,B,C	a,b,c
Operations	$\wedge$, $\vee$, $\neg$	$\cap$, $\cup$, $'$	$\cdot$, $+$, $'$
Special elements	c,t	$\emptyset,U$	$0,1$

3. Rewrite the logical equivalences in Boolean algebra notation:

a. $(p \wedge q)$ **b.** $(p \vee q)$ **c.** $\neg p$ **(___/8)**

d. $(p \wedge \neg q) \vee p$ **e.** $\neg(\neg p \wedge q)$ **f.** $(p \vee q) \equiv p$

g. $(p \wedge \neg q) \vee p \equiv p$ **h.** $\neg(\neg p \wedge q) \wedge (p \vee q) \equiv p$

4. Rewrite the set equalities in Boolean algebra notation:

a. $(A \cap B)$ **b.** $(A \cup B)$ **c.** A' **(___/8)**

d. $A \cap (B' \cup A) = A$ **e.** $(A - B)$ **f.** $A' \cup (A \cap B)$

g. $(A - B)' = A' \cup (A \cap B)$

h. $(A \cup B) \cap (A' \cap C)' = A \cup (B \cap C')$