MATH 270
SUMMER 2007
HOMEWORK 4

Due Tuesday June 26, 2007.

1. (3 pt) Let A and B be sets contained in a universal set U. Show that $A \setminus (B \setminus A) = (A \setminus B) \setminus A$ if and only if $A = \emptyset$.

2. Let $\{A_i\}_{i \in \Lambda}$ be a family of sets all contained in a universal set U. Show the following.

    a) (3 pt) $(\bigcup_{i \in \Lambda} A_i)^c = \bigcap_{i \in \Lambda} A_i^c$.

    b) (3 pt) $(\bigcap_{i \in \Lambda} A_i)^c = \bigcup_{i \in \Lambda} A_i^c$.

3. Let A, B, C be sets and recall that if X is a set then $P(X)$ denotes the power set of X.

    a) (5 pt) Show that $P(A \bigcap B) = P(A) \bigcap P(B)$.

    b) (5 pt) Show that $P(A) \bigcup P(B) \subseteq P(A \bigcup B)$.

    c) (5 pt) Find a condition in terms only of the sets A and B (as opposed to their power sets) that is equivalent to set equality holding in part b) (and prove that this condition is equivalent to set equality in part b)).

4. (5 pt) Is there a set of *all* sets? To start this problem, assume that there is a set X consisting of all sets and consider $Y = \{W \in X | W \notin W\}$.