

18.S097 Introduction to Proofs  
IAP 2015  
Homework 1  
Due: Wednesday, Jan. 7, 2015

**Problem 1.** *Let  $X$  be a set, and let  $A, B \subset X$  be two subsets. Write down a rigorous proof of the equalities*

$$(A \cup B)^c = (A^c) \cap (B^c)$$

*and*

$$(A \cap B)^c = (A^c) \cup (B^c).$$

Hint: Use the style of proof which we saw on the example sheet. Each set equality consists of two inclusions.

To give a starting point, the argument for the inclusion  $(A \cup B)^c \subset (A^c) \cap (B^c)$  might begin with: “Let  $x \in (A \cup B)^c$  be given. We then have  $x \in X$ , but  $x$  does not belong to the set  $A \cup B$  (that is, the statement “ $x \in A$  or  $x \in B$ ” is false). (...)”