

Homework 4, Math 310, due October 1st, 2012

Below are some exercises in writing proofs. Write them in English. In particular, do not use the symbols \wedge, \vee, \neg . You may use other symbols as you see fit, but try not to overdo them, since it will make it harder to read. On questions about real numbers, you are allowed to use all the standard properties that you know, but if you feel it is not standard, either prove them or quote the result explicitly to make the proof complete. Use your judgement.

- (1) Prove that there exists a set X such that for any set A , $A \cup X = A$.
- (2) If A, B, C are sets, prove that $A \cap (B \cup C) = (A \cap B) \cup (A \cap C)$.
- (3) Do exercise 12, page 107 from the book.
- (4) Do exercise 6, page 122.
- (5) Prove that for all $x \in \mathbb{R}$, $x^2 + x + 1 > 0$.
- (6) Given $\epsilon > 0$ show that there exists a $\delta > 0$ such that for any real number x , if $|x - 3| < \delta$ then $|x^2 - 9| < \epsilon$.