

# Math 314 Homework II

Dr. Holmes

September 4, 2009

This assignment is due on Friday the 11th. Visiting me in my office is encouraged!

1. Write a proof of the theorem “the sum of any two odd natural numbers is even” in the same style as the proof of “the product of any two odd natural numbers is odd” in the notes. Of course you need to define “even”.
2. Write a proof of the theorem “the composition of two surjections is a surjection” in the same style as the proof of the theorem about injections in the notes. You may think just of functions from the reals to the reals, as I did in the notes. A function  $f$  is surjective (onto the reals) iff for any real  $y$  there is a real  $x$  such that  $f(x) = y$ .
3. Prove two of the following familiar theorems of Peano arithmetic. If you prove more you might get extra credit. You may assume the theorems proved in the notes, and you may assume the associative law of addition, which I also proved in class. I may add that proof to the notes eventually.

It is quite possible that the order in which I have given these is not the best order in which to try to prove them. You may want to prove special lemmas as I did in the proof of commutativity of addition.

- (a) the commutative law of multiplication
- (b) the associative law of multiplication
- (c) the distributive law of multiplication over addition (you might want to consider the left and right distributive laws separately if you do not prove commutativity of multiplication first).