Practice sheet for Math 3336, Test 4 Fall 2016

November 11, 2016

1. State the well-ordering principle for the set of natiural numbers.

2. State the principle of Mathematical Induction and prove it from the well-ordering principle.

3. Prove by mathematical induction.

a. $n < 2^n$

b. $\sum_{j=1}^{n} \frac{1}{2^j} = \frac{2^n - 1}{2^n}$

4. Prove by mathematical induction.

a. Prove that 3 divides $n^3 + 2n$ whenever n is a positive integer.

b. Prove that $2|n(n+1)$ whenever n is a positive integer.

c. Prove that $6|n^3 - 1$ whenever n is a positve integer.

5. Give a recursive definition of the sum $n + m$ of non-negative natural numbers.

6. Give a recursive definition of propositional formulas in $\neg, \wedge, \vee, \Rightarrow$ and prove by structural induction that for every propositional formula the number of left parentheses is the same as the number of right parentheses. **Answer**: Done in class.