

MATH 4/51001
Homework #1
Due: Friday, September 8

Reading:

For Wednesday, August 30: To the Student (pages xiii – xx of Preface)
Appendices A.1, A.4
For Friday, September 1: Appendices A.3, A.5 (not covered in class)
For Wednesday, September 6: §1.1, §1.2

Problems to turn in:

I. Let $S = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$. Determine the elements of the following sets.

- (a) $\{x \in S \mid x \text{ is odd}\}$
- (b) $\{y \in S \mid 6 < y \leq 9\}$
- (c) $\{z \in S \mid z > 8 \text{ or } z < 3\}$
- (d) $\{w \in S \mid w > 8 \text{ and } w < 3\}$

II. Show that if A and B are subsets of a set S , then $\overline{A \cup B} = \overline{A} \cap \overline{B}$.

§A.1: 4, 8, 10.

§A.4: 1, 2.

III. Use induction to prove that $1 + 3 + 5 + \cdots + (2n - 1) = n^2$ for $n \geq 1$.

IV. Use induction to prove that $\frac{1}{1 \cdot 2} + \frac{1}{2 \cdot 3} + \frac{1}{3 \cdot 4} + \cdots + \frac{1}{n(n+1)} = \frac{n}{n+1}$ for $n \geq 1$.

V. Use induction to prove that if x is a positive real number, then $(1 + x)^n \geq 1 + nx$ for all natural numbers $n \geq 1$.

Problems to be aware of:

§A.1: 1, 5, 6, 7, 9.

§A.4: 3, 4, 6.