CHAPTER 1 HOMEWORK

MAT 421: NUMBER THEORY

Directions: Each group is responsible for all of the problems listed. No problem should be attempted before we cover the material indicated with it. I only need one submission from each group. I will give time in class for groups to meet and work; however, you should plan to meet outside class as well.

1. Groups

Group 1	Group 2	Group 3
Ryan Anderson	Aaron Ayers	Sr. Maria Acosta
Melissa Dyess	Nevada Brown	Lorelei Jones
Kristie West	Joel Huber	Stephanie Williams
Shannon West		

2. Exercises

Ab ovo **(§1.3: Mathematical Induction).** Most of these problems, if not all, require induction. Since MAT 340 is a prerequisite to this course, I assume you know what induction is. Don't let this frighten you too much: I will do a few examples the first few days.

- p. 27 #2, 18, 30

§1.1: Numbers and Sequences.

- *After the well-ordering property of $\mathbb{Z}$:* p. 12 #2, 6
  Hint on #2: You have to show the set is nonempty; then it takes care of itself.
- *After the definition of sequences:* p. 13 #24
- *After countable and uncountable:* p. 14 #26, 28
  Hint on #28: Call the two sets S and T. First define a function from $\mathbb{Z}$ onto $S \cup T$; then from $\mathbb{Z}^+$ onto $S \cup T$ *via* $\mathbb{Z}$.
- *After the definition of real numbers:* p. 12 #4
- *After the proof that $\sqrt{2}+\sqrt{3}$ is algebraic:*
  Let $a, b \in \mathbb{Z}^+$. Show the following are algebraic: $\sqrt{a}$, $\sqrt{a} \cdot \sqrt{b}$, $\frac{\sqrt{a}}{\sqrt{b}}$, $\sqrt{a} \pm \sqrt{b}$.
- *After the definition of $[x]$:* p. 14 #12, 38
- *After the proof of the Dirichlet Approximation Theorem:* p. 13 #30(a,c)

§1.2: Sums and Products.

- *After the definition of sum and product notation:* p. 20 #2
- *After geometric sums:* p. 20 #4
- *After telescoping sums:* p. 22 #22
- *After the proof that $\sum_{k=1}^{n} = \frac{n(n+1)}{2}$:* p. 21 #10, 11
  For #11: Just read the problem & the proof in the back of the book.
- *After factorials:* p. 22 #20

§1.4: The Fibonacci Numbers.

- *After the definition of the Fibonacci numbers:* p. 33 #2(a,b)
- *After we have done some examples of identities:* p. 33 #4, 10, 14
  Hint on #14: Read #35 first. You may use the result of #34 without proving it. For extra credit, prove it!

§1.5: Divisibility.

- *After Theorem 1.8:* p. 40 #4(a,b), 14, 16
- *After Theorem 1.9:* p. 41 #36
- *After Theorem 1.10:* p. 40 #26
- *After discussion of even, odd numbers:* p. 40 #38
- *After definition of relatively prime numbers:* p. 40 #12