Intro to Discrete Exam #2 Information/Review

Exam Date: Thursday, October 22, 1:30 - 2:45 pm

Exam Format:

Part A released at 1:30 pm, due 2:00 pm, late due time 2:10 pm
Part B released at 2:00 pm, due 2:45 pm, late due time 2:55 pm

<u>Just like last time, due times will be 100% strict.</u>

I can not emphasize this enough!!!

Part A will be everything but induction.
Part B will be induction.

I will make an effort to minimize what is difficult to type.

If necessary, you may write a sum in text. Here is an example:

$$\sum_{i=1}^{n} i^2$$

Can be expressed as Sum[i=1 to n of i^2]

Exam #2 Topic Outline

I. Number Theory

- **a. Mod Rules**
- **b. Modular Exponentiation by Hand**
- **c. Division Algorithm**
- **d. Euclid's Algorithm**
- **e. Extended Euclid's Algorithm**
- **f. Full Solution to ax+by = c for integers given a,b,c.**
- **g. Finding modular inverses**
- **h. Divisibility proofs**
- **i. Pi notation**
- **j. Fundamental Thm of Algebra**
- **k. Least Common Multiple (LCM)**
- **l. Connection between LCM and GCD**
- **m. Calculating # of divisors of an integer.**
- **n. Calculating the sum of divisors of an integer.**
- **o. Calculating the number of times prime p divides into n!**
- **p. Proof there are an infinite # of primes.**

II. Sums, Matrices, Recursively Defined Sequences

- **a. Summation Definition**
- **b. Solving sums of standard functions given base formulas.**
- **c. Proof of sum of i, and Geometric Sum Formula**
- **d. Use of Telescopic Sum idea to solve sums that are neither arithmetic nor geometric.**
- **e. Using Integrals to bound sums.**
- **f. How to recursively define sequences**
- **g. Matrix Addition, Subtraction, Multiplication**

III. Mathematical Induction

- **a. Base Case**
- **b. Inductive Hypothesis**
- **c. Inductive Step**
- **d. Summation Rules**
- **e. Not all induction problems use summations**
- **f. How to deal with inequalities**
- **g. Strong Induction**
- **h. Divisibility Problems**
- **i. Matrix Exponentiation Problems**
- **j. Problems with recursively defined sequences**
- **k. Problems with Harmonic numbers**
- **l. Unorthodox Examples - NIM, Nuggets, Trominos**

IV. General Math from Recitation

- **a. Arithmetic/Geometric Sequences**
- **b. Factorization**
- **c. Average Problems**