Math 350 Midterm 1 Review

Exam Format

The exam will consist of two components: A written portion and a computer portion.

The written part of the exam should take about 30–45 minutes to complete. No computers are permitted for this part of the exam. When done with the written part, turn in your work and then use the remaining class time to complete the computer portion.

For the computer portion of the exam, you can use Mathematica and its documentation but not our previous lectures or sets or any internet resources. Turn in the computer portion to Canvas as usual.

The written portion

There will be 4 types of problems on the written portion of the exam:

1. Write down Mathematica code that will produce the following output (without simply recopying the expression as written, of course!).

   For example, can you produce `{2, 4, 6, 8, 10, 12, 14, 16, 18, 20}`?

2. What would result if these expressions are evaluated? (Act as Mathematica and run the code).

   For example, what does this do?: `Apply[Times, x + y]`

   How about this?: `Range@10 /. {x_ /; EvenQ@x -> (x-1), y_ /; OddQ@y -> 1}`

3. Using English sentences, describe what the following commands will do.

   For example, what does this do?: `FactorInteger[1 + Times @@ Prime@Range@100]`

4. Write down Mathematica commands that will output the following.

   For example, write code to find the largest Fibonacci number smaller than 10^6.

The computer portion

The computer portion of the exam will contain questions similar to those found in the Lectures and the Sets. I am aware that some of those questions can take a while to figure out, and so I have tried to design the exam to be doable in the given time frame (provided you have been keeping up with the course).

Here are sample questions for the computer portion of the exam:

- What is longest word in `WordList[]` that does not contain the letter 'e'?
- Find a pair $\{a, b\}$ of positive integers such that $888 + a^2 = b^2$.
- What is the probability that a permutation of $\{1, 2, ..., 8\}$ will never have the integers i and $i + 1$ appear consecutively for any i?
- Define a function that has input an integer n and output the largest prime divisor of n.
- Using memoization, define a sequence $a[n]$ such that $a[1] = 1$, $a[n + 1]$ is equal to $a[n]/n$ if this is an integer, and $na[n]$ otherwise. What is $a[100]$?