Math 121A Midterm Exam Review Outline

Topics: Exam one will cover the mathematical topics from class meetings during week one through week five. The relevant homework assignments are HW1, HW2, HW3, HW4 and HW5. In order to do well on the exam, make sure you understand how to solve all of the homework problems from the aforementioned assignments as well as all of the in-class problems from weeks one through week five (you can find copies of the in-class problems on the course calendar).

Theorems and Definitions: You are also responsible for knowing the following definitions as well as the statements of the following theorems together with their proofs. You should be comfortable using the definitions and applying the theorems in contexts as in the homework and in-class problems.

- Def’n (and notation): Average rate of change of a function on an interval
- Thm: A function \( f : \mathbb{R} \to \mathbb{R} \) is linear if and only if its average rate of change is the same on any interval.
- Thm: A sequence is a linear (aka arithmetic) sequence if and only if its sequence of first differences is a constant (non-zero) sequence.
- Thm: A sequence is a quadratic sequence if and only if its sequence of second differences is a constant (non-zero) sequence. (Note: You may use higher order analogs of this theorem without proof, e.g. cubic sequences, quartic sequences, etc.)
- Thm: A sequence is an exponential (aka geometric) sequence if and only if dividing any term in the sequence by the preceding term always results in the same (non-zero) number.

Other notes:
- The exam is closed book and closed notes. You are allowed to use a calculator during the exam, but you cannot use an iPhone or any other device that can connect to the internet.
- In case you find them useful, the following formulas will be written on your exam sheet.

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(1) \sum_{i=1}^{n} i = \frac{n(n + 1)}{2}
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(2) \sum_{i=1}^{n} i^2 = \frac{n(n + 1)(2n + 1)}{6}
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