DEFINITIONS, STATEMENTS, AND PROOFS TO KNOW FOR EXAMS IN MATH 315 AS TAUGHT FALL 2009

N. CHRISTOPHER PHILLIPS

Students were expected to know some of the definitions and proofs from the book for the exams, well enough to be able to give complete and correct statements of the definitions and complete and correct statements and proofs of the theorems. (They did not need to be able to reproduce the motivation and discussion, just the proofs. The proofs did not need be exactly the same as those in the book, but did need to be complete and correct.)

As far as I can tell, this kind of thing was not normally expected in previous versions of the course.

The textbook was Stephen Abbott, *Understanding Analysis*, Springer-Verlag, New York, 2001.

- For Midterm 1:
  - Definitions and statements:
    - The Axiom of Completeness (on page 14).
    - Definition 1.3.2.
    - Definition 2.2.3.
  - Proofs:
    - 1.3.7
    - 1.4.1
    - 2.3.2
    - 2.3.3(2)
    - 2.3.3(3)
    - 2.3.4(1)
    - 2.4.2
- For Midterm 2, everything required for Midterm 1, as well as the following:
  - Definitions and statements:
    - The definition of convergence of a series.
    - The definition of an open set.
    - The definition of a closed set.
    - The definition of a compact set.
    - The statement of the Heine-Borel Theorem (Theorem 3.3.4).
    - The definition of a disconnected or connected set (including the definition of separated sets).
  - Proofs:
    - 2.6.4
    - 2.7.4
    - 2.7.6
    - 3.2.3

Date: 27 January 2010.

    * 3.2.13
- For the final exam, everything required for Midterms 1 and 2, as well as the following:
  - Definitions and statements:
    * Definition 4.2.1 or 4.2.1B (definition of the limit of a function).
    * Statement of Theorem 4.4.3 (the Extreme Value Theorem).
    * Statement of Theorem 4.5.1 (the Intermediate Value Theorem).
    * Statement of Theorem 4.5.2 (Preservation of Connectedness).
    * 5.2.1 (definition of of the derivative of a function). (I don't care if you use the equivalent form of the difference quotient,
      $$\lim_{h \to 0} \frac{f(c+h) - f(c)}{h},$$
      intead of the one used in the book.)
    * Statement of Theorem 5.2.6 (Interior Extremum Theorem).
    * Definition 6.2.3 (definition of uniform convergence of a sequence of functions).
    * Definition 6.4.1 (definition of uniform convergence of a series of functions).
  - Proofs:
    * Theorem 4.3.9 (composition of continuous functions).
    * Theorem 4.4.2 (Preservation of compact sets).
    * Theorem 5.2.4(i) (sum rule for derivatives).
    * Theorem 5.2.4(iii) (product rule for derivatives).
    * Theorem 5.3.1 (Rolle's Theorem).
    * Theorem 6.2.6 (the uniform limit of continuous functions is continuous).