## Post-Midterm 2 Conceptual Review

Math 500: Intermediate Analysis, Spring 2017

- The integral (§§5.1 5.2)
- **Concepts**: partition, refinement of a partition, Riemann sum, upper sum, lower sum, upper integral, lower integral, Riemann integral
- Goals: Calculate Riemann sum corresponding to a partition, calculate upper sum and lower sum, calculate the Riemann integral as a limit of a Riemann sum, prove and apply properties of integrals
- Homework problems:  $\S5.1$ : #1 5, 8;  $\S5.2$ : #1, 4, 6, 11, 12
- Additional practice problems:  $\S5.1$ : #6, 9;  $\S5.2$ : #3, 5, 7
- The Fundamental Theorems of Calculus (§5.2)
- **Concepts**: the First FTC, the Second FTC, the proofs of the substitution rule and integration by parts
- Goals: Apply the FTCs, checking their hypotheses
- Homework problems: §5.2: #2 6, 10 12
- Additional practice problems:  $\S5.2$ : #7, 8
- Logarithms and exponentials (§5.4)
- **Concepts**: the natural logarithm function, the exponential function  $\exp(x)$ , arbitrary logarithm and exponential functions
- Goals: understand the precise definition of logarithm and exponential functions, prove properties
  of these functions using the definitions
- Homework problems:  $\S5.2: \#1, 2, 4 6$
- Additional practice problems:  $\S5.2$ : #3, 7
- Improper integrals (§5.4)
- Concepts: improper integral with unbounded domain, improper integrals with unbounded values, convergence/divergence of improper integrals
- Goals: rewrite an improper integral as the limit(s) of integral(s) of a bounded function on a closed, bounded interval (proper integral(s)); decide whether an improper integral converges or diverges (and compute its value if it converges; prove properties of improper integrals using their definition
- Homework problems: §5.2: #10, 11, 13
- Additional practice problems:  $\S5.2$ : #9, 12
- Infinite series  $(\S\S6.1 6.2)$
- Concepts: partial sum, infinite series, convergence/divergence of series, convergence tests
- **Goals**: decide whether a series converges or diverges using partial sums; prove general statements about convergence of series; apply convergence tests that we strengthened using analysis concepts
- Homework problems: §6.1: #2, 5, 11; §6.2: #1, 4, 9, 12; §6.2: #4 7, 9
- Additional practice problems: §6.1: #14; §6.2: #10, 11; §6.2: #10
- Power series (§6.4)
- **Concepts**: Series of functions, uniform convergence of a series of functions on an interval, Weierstrass *M*-test, power series, radius of convergence, integration/differentiation of power series
- Goals: Use uniform convergence and the Weierstrass M-test to show that a series of functions converges to a continuous function on a given interval
- **Homework problems**: §6.4: #1, 2, 10
- Additional practice problems:  $\S6.4$ : #3