SM333 – Sequences, Series and Functions
Fall 2019 - Syllabus

Textbook: David Brannan, *A First Course in Mathematical Analysis*, Cambridge University Press, 2006.

Classes	Section	Topic
1 - 2	1.1	Real numbers – decimal expansions of rationals vs. irrationals; order properties, including Archimedean property and density
3	1.2	Inequalities and absolute values (a review)
4	1.3	Triangle inequality, reverse triangle inequality (a review), Bernoulli's inequality, and Cauchy-Schwarz inequality
5 - 7	1.4	Bounds – upper bounds, lower bounds, max, min, sup, inf, least upper bound property
8	2.1	Introduction to sequences
9 - 11	2.2	Null sequences, non-null sequences
12		Review for Test 1
13		Test #1
14 - 16	2.3	Convergent sequences – definition in terms of null sequences and in terms of epsilon-X
17 - 19	2.4	Divergent sequences, subsequences, divergence to infinity
20 - 21	2.5	Monotone Convergence Theorem, Bolzano-Weierstrass Theorem, recursively defined sequences
22 - 23	3.1	Introduction to series – partial sums, convergence, geometric series, telescoping series, non-null test, combination rules
24 - 26	3.2	Series with non-negative terms – Boundedness Theorem, Comparison and Limit Comparison Test, Ratio test
27	Notes	Integral Test
28 - 30	3.3	Series with positive and negative terms, absolute convergence, absolute convergence test, alternating series test, rearrangements
31		Review for Test 2
32		Test #2
33 - 36	4.1	Continuous functions – definition, rules (sum, squeeze, composition, etc.), continuity of the trig functions and the exponential function
37 - 39	4.2	Intermediate Value Theorem, Extreme Value Theorem, and corollaries
40 - 41	Notes	Sequences of functions and pointwise convergence, properties not preserved
42 – 43	Notes	Uniform convergence
44 – 45	Notes	Properties preserved under uniform convergence
46	Notes	Series of function, pointwise and uniform convergence
47	Notes	Weierstrass M-test and other tests for uniform convergence
48	Notes	Properties of uniformly convergent series
49	8.3	Power series and interval of convergence

50	Notes	Term by term integration and differentiation
51		Review for Test 3
52		Test #3
53	8.1	Taylor polynomials
54 – 55	8.2	Taylor's Theorem
56 - 57	8.4	Manipulating power series
58 - 59		Review for Final

Objectives of SM333: Upon successful completion of this course, students can do the following:

- Find, with proof, maxima, minima, suprema, and infima of sets of real numbers when they exist. Prove that they do not exist when this is the case.
- Prove that a convergent sequence converges and prove that a divergent sequence diverges using definitions and using appropriate theorems.
- Use various tests to determine whether a series of numbers is convergent or divergent.
- Determine, with proof, whether some sequences and series of functions converge uniformly, converge pointwise, or diverge.

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