Math 107 — Spring 2019 — Summary of topics covered

1. Meaning and interpretations of definite and indefinite integrals:

   (a) Area under curve — e.g. Exam I problem #1
   (b) Displacement
   (c) Fundamental Theorem of Calculus — e.g. Exam I problem #1

2. Methods of finding anti-derivatives

   (a) basic formulas — e.g. Exam I problem #1b
   (b) substitution — e.g. Exam I problem #4, #5
   (c) integration by parts — e.g. Exam I problem #6
   (d) partial fractions — e.g. Exam I problem #8
   (e) trigonometric substitutions — e.g. Exam I problem #3

3. Improper integrals

   (a) computing them as a limit of definite integrals — e.g. Exam I problem #6, #7
   (b) convergence vs. divergence — e.g. Exam I problem #6, #7
   (c) comparison test for convergence — e.g. Exam I problem #2

4. Applications of the definite integral

   (a) area and volume — e.g. Exam II problem #3, #4
   (b) polar coordinates, area in polar coordinates — e.g. Exam II problem #5, #6
   (c) finding mass/population from density (1, 2 and 3-D versions) — e.g. Exam II problem #1
   (d) work — e.g. Exam II problem #7

5. Series

   (a) definition as a limit of finite partial sums
   (b) geometric series (finite and infinite) — e.g. Exam II problem #2, #8 and Exam III Problem #1
   (c) convergence vs. divergence
   (d) tests for convergence of series:
       i. n-th term test
       ii. integral test — e.g. Exam II problem #9
       iii. p-test — e.g. Exam III Problem #6b
       iv. comparison test — e.g. Exam III problem #3a, #6c
       v. limit comparison test — e.g. Exam III problem #3b
       vi. ratio test — e.g. Exam II problem #4b, #6a
       vii. alternating series test — e.g. Exam III problem #3c, #6d
   (e) absolute vs. conditional convergence — e.g. Exam III problem #2
   (f) approximating series: alternating series theorem

6. Power series and Taylor series

   (a) definition of a power series — e.g. Exam III problem #4a
   (b) radius and interval of convergence — e.g. Exam III problem #4bc, #5
   (c) Taylor polynomials of a function — e.g. Exam III problem #9
   (d) Taylor series of a function — e.g. Exam III problem #9
   (e) standard examples of Taylor series — e.g. Exam III problem #7
   (f) manipulating Taylor series by subsitution, addition, multiplication, differentiation, and integration — e.g. Exam III problem #8, #10
   (g) applications of Taylor series — e.g. Exam III problem #10