

MATH 101 Course Outline

Differential Calculus with Applications to Physical Sciences and Engineering
2013W Term 2

MATH 101 is a course in integral calculus and sequences and series, with applications and examples drawn primarily from physical sciences and engineering. This course is equivalent in technical content to MATH 103 and 105 and serves as a pre-requisite for many second year MATH courses. The text book for MATH 101 is *Calculus: Early Transcendentals*, 7th Edition, by James Stewart.

Please note that “Week” below typically means 3 lecture hours, but this will vary. Bracketed numbers refer to sections in the text.

There is one common midterm scheduled in the term. This will be held in the early evening and is tentatively set for Tuesday, February 25th.

This course is heavily coordinated, but individual instructors will have their own style. Be assured that the content taught will be the same across all sections in spite of this, and that all sections will be prepared for the common midterms and common final exam.

Week 1 Areas and Distances (5.1) and the Definite Integral (5.2).

Week 2 The Fundamental Theorem of Calculus (5.3). Indefinitely integrals and the Net Change Theorem (5.4). The Substitution Rule (5.5).

Week 3 Areas between curves (6.1). Volumes (6.2).

Week 4 Work (6.4). Average Value of a Function (6.5). Integration by Parts (7.1 but ignore reduction formulas).

Week 5 Trigonometric Integrals (7.2 but ignore $\sin mx$, $\cos nx$, etc.). Trigonometric substitutions (7.3 but ignore inverse secant and inverse hyperbolic substitutions). Integration of rational functions by partial fractions (7.4 but ignore CASE VI: $Q(x)$ contains a repeated irreducible quadratic factor).

Week 6 Strategy for integration (7.5). Approximate integration (7.7). Improper integrals (7.8).

Midterm Break No classes during break week.

Mid-term (Tuesday, February 25th, 6 p.m. to 8 p.m.)

Week 7 Applications to Physics and Engineering (8.3 but ignore hydrostatic pressure and force and the Theorem of Pappus). Separable equations (9.3 but ignore orthogonal trajectories).

Week 8 Sequences (11.1 but ignore definitions 2 and 5, Example 6, and the proof of the Monotonic Sequence Theorem). Series (11.2).

Week 9 The integral test (11.3 but ignore estimating the sum of a series and the proof of the integral test). Comparison tests (11.4 but ignore estimating sums).

Week 10 Alternating series (11.5). Absolute convergence and the ratio test (11.6 but ignore the root test).

Week 11 Power series (11.8). Representations of functions as power series (11.9).

Week 12 Taylor and Maclaurin series (11.10 but ignore binomial series).