

**MAT136H1F – REVIEW SHEET**  
**FALL 2014**

This sheet serves as a summary of the most important concepts and techniques covered by the course; it is not a substitute for studying your lecture notes or reading through the textbook. How should you study?

- learn the definitions and be able to explain the key concepts to someone who never heard them before,
- understand the main theorems of each chapter,
- solve as many problems as you can!

Once you are familiar with the key concepts and the examples we did on class, start solving each section of each quiz. Proceed by solving the term test and make-up term test as well and the practice problems from the syllabus (you can find everything on the webpage).

1. BASICS OF INTEGRALS

**Textbook sections:** 4.9, 5.1-5.4

**Key concepts, definitions:** antiderivative; area and distance problem; definite integral; indefinite integral.

**You must practice and be familiar with:** finding antiderivatives; properties of integrals; stating and applying the Fundamental Theorem of Calculus (both parts); Net Change Theorem.

2. VARIOUS TECHNIQUES OF INTEGRATION

**Textbook sections:** 5.5, 7.1-7.5, 7.8

**Key concepts, definitions:** improper integral; divergence and convergence of improper integrals.

**You must practice and be familiar with:** applying the substitution rule for definite and indefinite integrals; integrals of symmetric functions; applying integration by parts for definite and indefinite integrals; strategies for evaluating trigonometric integrals; trigonometric substitutions; integration by partial fractions; evaluating improper integrals.

3. APPLICATIONS OF INTEGRALS

**Textbook sections:** 6.1-6.3, 6.5, 8.1

**Key concepts, definitions:** volume; solids of revolution; average value of a function; arc length.

**You must practice and be familiar with:** finding areas between curves; finding volumes by integrals, cylindrical shells and the washer method; the Mean Value Theorem for Integrals; the Arc Length Formula.

4. DIFFERENTIAL EQUATIONS (DE)

**Textbook sections:** 9.1-9.4, 9.6

**Key concepts, definitions:** models of population growth (logistic DE); carrying capacity; equilibrium solutions of a DE; initial condition and initial-value problem; direction field of a DE.

**You must practice and be familiar with:** solving separable DE; solving the logistic DE; predator-prey equations.

## 5. SEQUENCES AND SERIES

**Textbook sections:** 11.1-11.7

**Key concepts, definitions:** sequences and series (what is the difference?), convergence of a sequence; partial sums and convergence of a series; geometric and  $p$ -series; absolutely and conditionally convergent series.

**You must practice and be familiar with:** Monotonic Sequence Theorem, calculating limits of sequences; tests of convergence and divergence of a series: limit of terms is non zero, comparison tests, integral test, alternating series test; alternating series estimation; tests of absolute convergence: ratio and root tests;

## 6. POWER SERIES AND TAYLOR/MACLAURIN SERIES

**Textbook sections:** 11.8-11.10

**Key concepts, definitions:** power series (around  $a$ ); radius and interval of convergence; Taylor and MacLaurin series of a function  $f$ ; Taylor polynomials of a function  $f$ .

**You must practice and be familiar with:** finding the radius and interval of convergence for a power series; representing functions as power series using the geometric series; integrals and derivatives of power series; how to show that the Taylor series of  $f$  is a representation of  $f$  (applying Taylor's inequality); Taylor series of elementary function ( $\sin(x)$ ,  $\cos(x)$ ,  $\ln(1+x)$ ,  $e^x$  binomial series); using the alternating series estimation for approximating integrals of series.