Department of Mathematics, University of Manitoba
MATH 2170 Introduction to Number Theory
2019 Winter Term
Information for Students

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Regular **office hours** will be announced separately, and will be posted on my web page, with regular updates.

TEXT AND REFERENCE MATERIAL:
An Introduction to the Theory of Numbers, Fifth edition, Ivan Niven, Herbert S. Zuckerman, and Hugh L. Montgomery, John Wiley and Sons, 1991.

I strongly recommend that you acquire a copy of the text. There will be a copy on 1 day reserve in the Science Library. This text is also commonly used for upper level Number Theory courses.

Please be aware that the many so-called "free" versions of this text that can be found on-line are pirated copies. Neither the authors nor the publisher receive any benefit from them. Neither accuracy nor completeness can be guaranteed. Using University resources to download or print these pirated copies violates both University Policy and the Canadian Copyright Act.

This is a fine book and a fine reference for further topics in Number Theory, but **you must be aware** that your Instructor has a strong disagreement with the Authors over the use of the number "0", and many of the definitions and theorems presented in class will have small differences from the text presentation. You are responsible for learning these things the way that I teach them.

Additional references: Suitable books are found in the library under the call letters QA 241, along with many more advanced books. Some other books that you may find particularly useful are those by Underwood Dudley, Silverman, Burton, Erickson, Tattersall, Robbins, and Parent.

TUTORIALS: Tutorials begin on January 14. You will receive suggested questions from the text almost every lecture. Sometimes I will offer to give a specific question a critical assessment if the work is handed in during the next lecture; this will be for feedback only and no credit will be assigned, nor will penalties be assessed for work not handed in. You will have the opportunity to get help with exercises during the tutorial sessions, which are intended as problem-solving sessions supplementing the lectures. There is no credit given for work done during these periods.

EVALUATION:

- At the end of the last class of each week, starting January 11, there will be a 5 minute, single question, quiz asking for a definition or statement of a theorem from the preceding two or three lectures. These 12 quizzes will each be scored out of 3; and the sum of all your scores will be converted to a score out of 6% according to the formula "$\min\{\text{total}, 30\}/5$". There are no deferred or make-up quizzes.
- There will be eight, equally weighted, written assignments during the term, for credit. A penalty may be assessed for late assignments. Do **not** assume that I will agree to accept late assignments. These assignments will count for a total of 20% of your final grade. I strongly encourage you to take advantage of my office hours to consult with me about your work on the assignments before you hand them in.
- There will be two 45 minute term exams [worth 12% of the final grade each] held during the tutorial sessions on February 11 and March 18. Deferrals are granted only for the reasons the University normally accepts for deferral of a final examination. The precise list of topics to be tested will be announced about a week and a half before each test.
- There will be a formal 3 hour final exam [worth 50%] during the exam period in April.

A mark of 60/100 or better will guarantee a letter grade of "C"; a mark of 83/100 or better will guarantee a letter grade of "A", with the other grades distributed equally between. Actual grade cut-offs may be set lower at the end of the term, after assessing the relative difficulties of the exams. An "A+" is awarded for consistent high performance in all aspects of the course, including independent insight into the course material.

USE OF LaTeX: Students are welcome to submit solutions using LaTeX if they so desire; this is entirely optional, and I will not be able to spend any significant amount of time helping you with LaTeX type-settting questions. You will need to e-mail me and request the style files that support the assignment sources.

MATH 2170 Introduction to Number Theory

WEB SITE: https://server.math.umanitoba.ca/~tkucera/courses/MATH2170/

COURSE OUTLINE:

An Introduction to the Theory of Numbers, Fifth edition, Ivan Niven, Herbert S. Zuckerman, and Hugh L. Montgomery, John Wiley and Sons, 1991.

1. **Divisibility** Chapter 1, 1.1–1.3. Introduction. Review of Mathematical Induction. Divisibility. Primes.
2. **Congruences** Chapter 2, 2.1–2.3. Congruences. Solutions of Congruences. The Chinese Remainder Theorem. 2.5 Public Key Cryptography. [For self-study and enrichment ONLY: 2.4 Techniques of numerical computation.]
3. **Some Diophantine Equations** Chapter 5, 5.1–5.3. The equation $ax+by=c$. Simultaneous linear equations. Pythagorean triangles.
4. **Powers and quadratic residues** Chapter 2, 2.8 (to 2.37 only). Primitive roots and power residues. Chapter 3, 3.1, 3.2. Quadratic Residues. Quadratic reciprocity.
5. **Arithmetic functions** Chapter 4, 4.2, 4.3. Arithmetic functions. The Möbius inversion formula.

DATES:

Assignment due dates (in class) are Jan. 23, Jan. 30, Feb. 06, Feb. 27, Mar. 06, Mar. 13, Mar. 27, Apr. 03.
Assignments will normally be distributed about a week in advance of the due date, on material already covered.
Tests are February 11 and March 18, in the tutorial period.
The Voluntary Withdrawal deadline for winter term courses is Wednesday, March 20, 2018.

USE OF CALCULATORS: Many practical problems in this course will require the use of a calculator to make the arithmetic feasible, and *simple* calculators may be used on the assignments and tests. *Programmable* calculators, or calculator programs on a device such as a cell phone or tablet are prohibited at tests and exams, and you should verify with me in advance any device that you might want to bring to an exam.

ACADEMIC INTEGRITY DECLARATION: You will be asked to read the Statements on Assignments and Academic Integrity, and sign an **Academic Integrity Declaration** before the first Quiz.

NOTICE REGARDING COLLECTION, USE, AND DISCLOSURE OF PERSONAL INFORMATION BY THE UNIVERSITY:

Your personal information is being collected under the authority of The University of Manitoba Act. It will be used for the purposes of grading papers and providing feedback to students. Personal information will not be used or disclosed for other purposes, unless permitted by The Freedom of Information and Protection of Privacy Act (FIPPA). The University of Manitoba has taken steps to ensure that its agreements with Crowdmark, Inc. and WebAssign for services provided by the Crowdmark and WebAssign applications are in compliance with FIPPA. Please be aware that information held by Crowdmark Inc. and Webassign may be transmitted to and stored on servers outside of the University of Manitoba, or Canada. The University of Manitoba cannot and does not guarantee protection against the possible disclosure of your data including, without limitation, against possible secret disclosures of data to a foreign authority in accordance with the laws of another jurisdiction. If you have any questions about the collection of personal information, contact the Access and Privacy Office (tel. 204-474-9462), The University of Manitoba, 233 Elizabeth Dafoe Library, Winnipeg, Manitoba, Canada, R3T 2N2.

IMPORTANT GENERAL INFORMATION: Important general information for students is contained in **Schedule A**, available through the course web site.

USE OF TECHNOLOGY AND COPYRIGHT NOTICE:

It is the general University of Manitoba policy that all technology resources are to be used in a responsible, efficient, ethical and legal manner. In particular, cell-phones and other devices are not to be used for communication or entertainment during class time.