MAT 312/AMS 351, L01: Applied Algebra, Spring 2019
Midterm I Information

Thursday, 02/21, 10-11:20am, ESS 131

General Information

(1) Please *bring your SBU ID card* and show up no later than 9:55am. The exam will begin at 10am *sharp* and you will not receive extra time if you show up after 9:55am.

(2) You will receive an exam booklet (7 pages stapled together), with questions and plenty of space for solutions. Scrap paper will be available upon request. You can staple additional sheets to your exam booklet, but if you do so, please write your name and ID number on each additional sheet and indicate in the exam booklet where to find your solution. Any scrap paper that you do not want to be graded should not be handed in (except separately from the exams, for recycling). The exact front cover of the exam (except for the grade box) is at the end of this handout; if you have any questions about the instructions, please ask the instructor or TA before the exam.

(3) **NO** notes, books, calculators, phones, laptops, etc. may be used during the exam. Please bring pencils/pens and an eraser. The *only* items that may be on your desk during the exam are pencils/pens, an eraser, exam booklet, and the scrap paper provided by the proctor.

(4) When you receive the exam, please do not open it until the proctor says it is time to start. However, please do fill out the information on the front cover; fill in your name *precisely* as it appears on your SBU ID card.

(5) All problems on the exam should be stated unambiguously. If you feel there is an issue with a statement of a particular problem, please let the proctor know; however, the proctor will not confirm whether your interpretation of the problem is correct.

(6) When you are finished with the exam or when the time is called (whichever comes first), please take your exam booklet to the front along with your SBU ID card. Hand in your exam booklet and sign the photo roster under your picture immediately after. You can leave before the time is over, but please do so as quietly as possible and close the door very gently.

(7) Out of fairness to others, please do not open your exam booklet ahead of time and stop working when the time is over. Your exam score will be reduced by 5 points per minute of either violation.

(8) Copying answers from someone else or allowing someone else to copy your answers would constitute a grave breach of the *University Student Conduct Code* and lead to very sad consequences. In particular, you would receive a 0 for the exam and be reported to the Academic Judiciary (which would likely lead to significantly more unpleasant consequences).

(9) Midterm I will cover Chapter 1 from the textbook. You should know all definitions, understand and know how to use all theorems (without memorizing their numbers), follow their proofs, and be able to work out all examples and exercises from these sections and the 3 problem sets. The main notions/statements from each of the 6 sections and practice exercises are listed

below. The first list is not exhaustive. The practice exercises follow in three general categories: basic concepts, computations, and short proofs; the problems on Midterm I will cover these categories.

(10) During the Midterm I week (2/18-2/22), the TA will hold his OHs as usual (TuTh 6-7 at MLC and W 6-7 in S-240A). However, the instructor will not hold office hours due to other work obligations. MLC will be open as usual (M-Th 10-7).

Main notions/statements

Section 1.1: Corollary 1.3 (main theorem of the chapter), Well-Ordering Principle, Euclid's algorithm (non-matrix or matrix version, as you like)

Section 1.2: recursive definitions, proofs by mathematical induction

Section 1.3: Unique Factorization Theorem for $\mathbb{Z}^+$, existence of infinitely many primes

Section 1.4: modular arithmetic, congruence classes, existence and computation of modular inverses, $\mathbb{Z}_n \equiv \mathbb{Z}/n\mathbb{Z}$ vs. $G_n \equiv \mathbb{Z}_n^*$

Section 1.5: solving linear congruences and systems of congruences, Chinese Remainder Theorem

Section 1.6: Euler's theorem, RSA algorithm

Practice problems: p1; 1.1 1-7; 1.2 1-3,5-9; 1.3 1-9; 1.4 1-7; 1.5 1-4; 1.6 1-3,5-8,12,13

Warning: Chapter 1 is entirely about the set of integers,

$$\mathbb{Z} \equiv \{0, \pm 1, \pm 2, \dots\},$$

like back in elementary school. There *no* rational numbers (such as 2/3 or 10.5), irrational numbers (such as $\sqrt{2}$), or imaginary numbers (such as $\mathfrak{i}$). If any of your numerical answers or numerical computations on the exam contains non-integers numbers, you will receive *negative* the number of points allocated to that question.

MAT 312/AMS 351, L01
Midterm I

February 21, 2019 10-11:20am

Name:_____ **ID:**_____

first name *first*

Recitation: R01 R02 (circle yours)

M 11-11:53am W 12-12:53pm

DO NOT OPEN THIS EXAM YET

Instructions

(1) Fill in your name and Stony Brook ID number and circle your recitation number at the top of this cover sheet.

(2) This exam is closed-book and closed-notes; no calculators, no phones.

(3) Please write legibly to receive credit. Circle or box your final answers. If your solution to a problem does not fit on the page on which the problem is stated, please indicate on that page where in the exam to find (the rest of) your solution.

(4) You may continue your solutions on additional sheets of paper provided by the proctor. If you do so, please write your name and ID number at the top of each of them and staple them to the back of the exam (stapler available); otherwise, these sheets may get lost.

(5) Anything handed in will be graded; incorrect statements will be penalized even if they are in addition to complete and correct solutions. If you do not want something graded, please erase it or cross it out.

(6) Show your work; correct answers only will receive only partial credit (unless noted otherwise).

(7) Be careful to avoid making grievous errors that are subject to heavy penalties.

(8) If you need more blank paper, ask a proctor.

Out of fairness to others, please **stop working and close the exam as soon as the time is called**. A significant number of points will be taken off your exam score if you continue working after the time is called. You will be given a two-minute warning before the end.