Math 3325 Spring 2018 - Exam 2 Review
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Exam 2 will cover the material in Sections 2.5, 3.1–3.4*, 4.1-4.4* of A Transition to Advanced Mathematics (Seventh Edition) by Smith, Eggen, and St. Andre. Possible exercise types include true/false questions; statements of axioms, definitions, and major results; computational exercises; and exercises requiring theoretical arguments (proofs). The following are the most important concepts you should concentrate on while preparing yourselves for Exam 2. **Do not forget that your homework assignments serve as review exercises for your Exam.**

1. Definitions and axioms

You should be able to define and use the following.

(1) Cartesian product of sets
(2) Relation
(3) Domain and range of a relation
(4) Reflexive relation, symmetric relation, transitive relation
(5) Equivalence relation, equivalence class
(6) Congruence modulo m on $\mathbb{Z}$, $\mathbb{Z}_m$
(7) Partition of a Set
(8) Antisymmetric relation
(9) Partial order, partially ordered set
(10) Upper bound - supremum, lower bound - infimum
(11) Functions: domain, codomain, range
(12) Equality of functions
(13) One-to-one functions; Onto functions; Bijective functions

2. Computational techniques

(1) Compute the partition (given an equivalence relation)
(2) Describe the equivalence relation (given a partition)
(3) Find $\sup(S)$, $\inf(S)$, and upper and lower bounds for S, where S is a subset of a poset.
(4) Compute domain and range of a function.
(5) Find compostion of functions

3. Proof techniques

(1) Strong (complete) induction PCI
(2) Prove that a relation is an equivalence relation
(3) Prove that a relation is a partial order
(4) Prove that a relation is a function
(5) Prove that a function is 1-1/onto.

4. Theoretical results

You should know and be able to apply the following.

(1) Well-ordering principle for $\mathbb{N}$
(2) Division algorithm
(3) Theorem 3.2.2
(4) Theorem 3.2.3
(5) If R is an equivalence relation on a nonempty set A, then $\{[x] : x \in A\}$ is a partition of A.

5. Proofs

(1) Every natural number greater than 1 has a prime factor.
(You should be able to prove by PCI method or by using Well-Ordering Principle.)
(2) For every fixed positive integer m, $\equiv_m$ is an equivalence relation on $\mathbb{Z}$ (Theorem 3.2.2).
(3) If R is an equivalence relation on a nonempty set A, then $\{[x] : x \in A\}$ is a partition of A.

6. Suggested problems

2.5: 2, 5b	**3.1: 2e**
3.2: 2e, 5c	**3.3: 3ef, 8a**
3.4: 1d, 4b	4.1: 6a, 11d, 18

All your homework problems are
a good source of practice for your exam.