MATH 320: Topics in Combinatorics
Fall 2019
Midterm I Review

Logistics: The Midterm will be one hour long and will include material from Chapters 1 and 2. No books, notes, or other aides allowed.

Chapters 1 and 2:

- vocabulary: lists, words, passwords, binary number, ternary number, repetition allowed, repetition not allowed, power set, set of subsets, permutation, k-permutation, combination, committee, multi-set, Cartesian product of two sets, relation from set A to set B, function from set A to set B, bijection, one-to-one correspondence, one-to-one, onto, domain, codomain, range, function composition, inverse relation/function, equivalence relation, equivalence classes, congruence modulo n, divisibility, partition of a set, blocks of a partition, circular arrangements, k-to-one function, Stirling numbers of the second kind, Bell numbers, integer partitions and parts of an integer partition
- notation: $[n]$, $(n)_k$, $\binom{n}{k}$, $\left(\!\binom{n}{k}\!\right)$, $\mathrm{rng}(f)$, $\mathrm{dom}(f)$, $\mathrm{co}(f)$, $S(n,k)$, $P(n,k)$
- useful theorems/results: product principle, sum principle, the bijection principle, inherited properties, equivalence principle, pigeonhole principle (recall the most general versions Theorem 1.5.4 and Theorem 1.5.6), the Binomial Theorem,,
- tasks/problems:
  - Know the denominations and suits of a standard deck of 52 cards.
  - Counting the complement.
  - "Best of $2n-1$" series.
  - Checking that a function is well-defined.
  - How to determine equivalence classes.
  - The relationship between equivalence classes on the set A and partitions of the set A.
  - Know how to give a *bijective* proof or a *combinatorial* proof.
  - Counting using the language of distributions.
  - Be able to fill out the chart on page 81.
- things you won't be asked
  - to recall the great number of combinatorial identities
  - the formulas on pages 68 and 69 for how to calculate Bell numbers and Stirling numbers.