Review for Midterm 1

First Midterm: Sept. 25. Exam will focus more on mathematical part of the course (so e.g. there is no computational graphing). Calculator is allowed for the exam.

Descriptive Statistics (Chapter 2).

Central Tendency, Measures of variation: Mean, median, mode, variance for data sets. Empirical rule and Chebyshev rule.

Exercise 1: For a given set $\{2, -1, 5, 7, 8, 4, 0, 2, -1, 2\}$, find

(a). Its mean, median, mode and standard deviation.

(b). Using Empirical rule and Chebyshev rule to estimate what is the percentage of data fall in 2 standard deviation of the mean. Which method is better? (may discuss in class).

Probability (Chapter 3, minus 3.7, 3.9).

Probability: Simple event, events, and probability. Conditional probability and probability rules for unions and intersections. Mutually exclusive and independent events.

Exercise 2. Example 3.18 on page 86.

Counting rules: Multiplicative rule, combination rule, permutation rule and partition rule.

Exercise 3. School A will select 3 students for their student engineer team for a state competition. There are 10 Sophomore, 8 Junior and 6 senior (freshman is not qualified for the competition).

(a). How many different teams the school can send?

(b). How many different teams that have at least one senior?

(c). If the team is formed by a captain, a vice captain, and a regular team member, how many different teams the school can send?

Discrete random variables (Section 4.1-4.6).

Mean and variance for DRVs: Expected value, linearity property.

Exercise 4. For a given discrete random variable Y, will

$$(E(Y))^2 = E(Y^2)?$$

A hard question is: which value is bigger? (Need to know convexity and Jensen inequality).

Binomial distribution: Expected value and variance.

Exercise 5. For a binomial random variable Y for $n = 10$ with $p = .5$, find the probability of the value falling into 2 standard deviation of the mean. Comparing with the estimates from Empirical rule and Chebyshev rule.

Continuous random variables (Section 5.1-5.5).

Cumulative distribution and probability density function: Concept and computation. Need to know integration by parts.

Exercise 6. Let Y be a random variable with PDF $f(y) = ce^{-y}$ for $y \in [0, \infty)$, and $f(y) = 0$ for $y \leq 0$.

(a). Find c and the standard deviation of Y.

(b). Find its cumulative distribution function $F(y)$.

Uniform distribution and normal distribution: Probability density functions, mean and standard deviation of these random variables.

Exercise 7*. Can you find:

$$\int_0^\infty y^2 e^{-y^2} dy?$$

Exercise 8*. Show that the mean for Gamma probability distribution is $\alpha\beta$. (Example 5.13, page 192).

May add more later.

WARNING: YOU ARE RESPONSIBLE FOR CHECKING OUT MY TYPOS!

Comments and question to: mzhu@math.ou.edu