# MTH 341 Probability Review Guide for 3rd Exam Semester 091

### Section 6.1: Probability density functions

Know the definition for a probability density function f and distribution function F for a continuous random variable -- know how to use either f(x) or F(x) to to calculate $P(X \in A)$, for A an interval or union of intervals.
Show that a given function is a valid density, or find what constant must be as in problem 1 to be a valid density.
Practice problems like 1, 2, 5

### Section 6.2: Density function of a function of a random variable.

Given a density function f(x) or distribution function F(x) for a random variable X, calculate the distribution function and density function for a function of X, h(X) (using method of distribution functions).
Practice problems like example 6.4 and problems 1, 5

### Section 6.3: Expectations and Variances

Given the density function of a random variable X, calculate its expectation E(X) and its variance, V(X), and standard deviation.
Calculate the expectation of a function of a random variable, E(h(X)).
Problems like examples 6.8, 6.11 and problems 1, 2, 4, 8.

### Section 7.1: Uniform Random Variable

Distribution function, density, mean of a uniform random variable on an interval [a,b]
Problem like example 7.2 and 1, 3

### Section 7.2: Normal Random Variable.

Given the standard normal table (back of book).
Approximate a probability for a binomial distribution (including continuity correction).
Calculate the probability that a normal random variable falls within a given range.
Recognize the density function for a normal distribution with mean $\mu$ and standard deviation $\sigma$.
Use the Central Limit Theorem to approximate probabilities for Sums and Averages (Means) of independent and identically distributed random variables. (From Section 10.5)
Practice Problems: 1, 2, 6, 10; Also 10.5: problems 3 and 4.

### Section 7.3: Exponential Random Variable

Know the interpretation of the exponential random variable in a Poisson process.
Know its density and distribution function and expected value (mean).
Know the memoryless property and be able to derive it, apply it
Practice problems like Example 7.8, 7.10 and problems 1, 5.

### Section 8.1

For discrete X and Y defined on a sample space, formula for joint probability function p(x,y).
Given a joint probability function for discrete X and Y, calculate the marginal distributions (like example 8).
For continuous random variables X and Y, joint density function f(x,y) -- use to calculate probabilities.
Calculate marginal densities from joint density.
Problems like 3, 6, 7, 10, 11

### Section 8.2 Independent Random Variables

Know definition for independent random variables.
How to interpret this in terms of distribution functions (Theorem 8.3), probability mass functions (Theorem 8.4), and probability density functions(Theorem 8.7).
Know statements of Theorem 8.5 and 8.6.
Problems like Example 8.12, 8.15 and exercises 1, 2, 9, 11