Statistics (MATH 4733/5733) Spring 2012
Homework 1

Due: Wed. Jan 25, start of class

Instructions: Please read the homework policies and guidelines posted on the course webpage. You may **not** use a calculator (or computer) **except** for basic arithmetic functions (e.g., $+, -, \times, \div, \log 2, e^{1/2}, \sqrt{10}$). Make sure to write your name and course number in the top right corner of your solution set, as well as the assignment number on top. Please staple your homework. Sections and exercises refer to the exercises in the required course text.

Exercises marked with an asterisk ($*$) are for students of 5733 only.

Reading

Review Sections 2.1–2.7, 3.1–3.10, 4.1–4.4 of the text.

Read Sections 5.1-5.2

Conceptual questions

• If X has binomial distribution with unknown parameter $\theta = p$, how can one estimate θ given n sample measurements $k_1, \ldots, k_n$?

Written Assignment

Probability Review

Exercises 2.4.41, 2.5.16, 2.7.18, 3.10.1, 3.10.3, 4.2.14, 4.2.27, 4.3.17, 4.3.27, 4.4.4

Problem A. Let X be a random variable on $\{0, 1\}$ such that $P(X = 0) = p$ and $P(X = 1) = 1 - p$. (Here $0 \leq p \leq 1$.) Let $X_1, \ldots, X_n$ be a random sample of size n for X and put $Y = \sum_{i=1}^{n} X_i$.

(i) Determine the pdf for Y.

(ii) Derive a formula for $E(Y)$.

(iii) Derive a formula for $Var(Y)$.

Problem B. Let X be a continuous random variable with pdf $f_X(x; \lambda) = \lambda e^{\lambda x}$ for $x \geq 0$. (Here $\lambda > 0$.)

(i) Derive a formula for the cdf $F_X(x; \lambda)$.

(ii) Derive a formula for $E(X)$.

Estimation

Section 5.2: 1, 3, 4