

## Material Covered

Test 2 is cumulative but emphasizes Sections 3.1–3.6, and the method of moments (Section 4.2 and Appendix D).

Note that there is a summary at the end of each chapter that briefly reviews the most important topics of the chapter. You should also check the errata page to make sure you have corrected any errors in your text.

## Format

The exam will include both an in-class portion and a take-home portion. For the in-class portion, no notes are allowed, but I will provide you with the table on page 214.

In-class exam problems will be printed on paper without allowing room for your work. You will be given blank paper to do your work on. This allows you to use the amount of space you need for each problem, but requires that you do some things to help me out:

- Put your name on each sheet (just in case).
- Clearly label each problem, and leave some space between problems. Do not work in two columns.
- Leave margins around your work! I'll three-hole punch the paper to encourage you to leave a margin the left side. Make sure you also begin far enough down that page that the staple doesn't make part of your work impossible to read.
- You may put more than one problem on a page, but your work must be in order at the end. Don't start new problems on the bottom quarter of the page.

## Things you should be sure to know

1. basics of random variables (continuous and discrete)
  - (a) pmfs, pdfs, cdfs, probability and quantile calculations
  - (b) how and why to use the cdf method
  - (c) mean and expected value (including how to use `integrate()` and `sum()` as needed)
2. favorite distributions (continuous and discrete, see page 214)
  - (a) situations where they are (or might be) good models
  - (b) R functions: `dnorm()`, `pnorm()`, `qnorm()`, `rnorm()`, etc.
  - (c) using the method of moments to estimate parameters of a distribution (and use of `uniroot()` when the algebra is tricky)
  - (d) quantile-quantile plots (what they are, creating using `qqmath()` or “from scratch” using `xyplot()`, interpreting)
3. moment generating functions
  - (a) calculation
  - (b) obtaining mean and variance from mgf
  - (c) uniqueness and distribution recognition
  - (d) relationship to linear transformations of random variables
4. kernel density estimation (take-home portion only)

**Some Additional Comments**

- Be sure to look over your old homework so you can fix any problems detected there.
- No mystery numbers allowed. It should be clear where every number comes from.
  - If you use a calculator or computer to get a number, it must be clear from the work on your paper how someone else could get that number. (Write down the R code, for example.)
  - When doing combinatorics problems, make it clear where the component numbers are coming from.
  - Round as late as possible. Keep three significant digits. (Leading 0's are not significant digits.)
- Use notation well.
  - You are required to understand and use the notation we have introduced in class. This includes correct use of the equals sign (=).
  - If you received a “notation” comment on a problem set, be sure you understand it.
  - You may invent notation as long as you explain it.
- Don't be afraid to use words.

In any case, do your work in “paragraph order” (left to right, top to bottom).
- When doing probability problems be sure to identify the events and random variables involved.

For working with random variables, for example, it is often good to have statements like each of the following examples as part of your solution:

  - Let  $X$  = the time until the next customer arrives.  
(Describe the random variable in words.)
  - Then  $X \sim \text{Exp}(\lambda = 20)$ .  
(Specify the particular distribution of the random variable if it is one of our familiar examples.)
  - $P(X \geq 30) = 1 - P(X \leq 30) = 1 - \text{pexp}(30, 20)$   
(Identify the probability you are calculating and the R code used to get it.)

A similar approach should be used for other probability problems as well. This approach will help you think clearly and avoid errors. It will also help me grade your work.