Prob & Stats   Exam 3   Summary & Review

This exam will be posted online on Wed April 1 and will be due at 1:00 pm on Fri April 3.

This exam consists of 6 parts and is worth 60 points.

You may use a calculator on this exam, as well as your textbook, your notes, my lecture notes, and a calculus book. You may not talk with one another or anyone else, nor may you look up things on the internet. Other than what I've stated above, pretend you are in class taking the exam.

Your options for submitting your work:
1) If you are able, you can write you solutions on other paper and scan/photograph that work to send to me, that is preferred.
2) If you are unable to scan/photograph your work, you can either type your work into a Word file or directly into email. Don't worry about perfect notation, just do the best you can.
3) If snail mail works best for anyone, let me know and I will give you my home address.

If you are submitting electronically, this exam is due at 1:00 PM Eastern Time on Friday, April 3. If you are snail mailing it, it must be postmarked by April 3.

Topics:
Multiple variable pdfs/probabilities
Marginal pdfs/probabilities
Independent random variables and their pdfs
Unbiased estimators and their variances
Confidence Intervals for μ and p

Problems from old exams

1. (7 points each) Consider the following joint pdf for rvs X & Y:

$$f(x,y) = \begin{cases} 8xy & 0 < x < y < 1 \\ 0 & \text{elsewhere} \end{cases}$$

a) Sketch the region of positive probability (in an x-y plane)
If this seems too easy to be true, it's because it's really easy!

b) Find the marginal pdf of X

c) Find the marginal pdf of Y

d) Use your answers to parts (a) & (b) to determine if X & Y are independent or dependent rvs.

2. (7 points) Suppose X_1, X_2, ..., X_n, is a collection of n independent rvs, each with pdf

$$f(x) = \begin{cases} 2x & 0<x<1 \\ 0 & \text{elsewhere} \end{cases}$$

What is the joint pdf of X_1, X_2, ..., X_n?

3. (5 points each) The following chart shows the joint pdf of two random variables X & Y.

Y

		1	2
	1	0.40	0.10
X	2	0.20	0.15
	3	0.10	0.05

a)   Find the marginal pdf of X
b)   Find the marginal pdf of Y
c)   Determine if rv's X & Y are independent or dependent. Briefly explain how you can tell.

4. (10 points) A random sample (of size 200) was taken in October regarding the governor's race in Massachusetts. That sample found that 46% of the people favored Baker for governor. Construct a 95% confidence interval for the true percentage of people who favored Baker.

5. (10 points) A savings and loan association needs information concerning the checking account balances of its local customers. A random sample of 14 accounts was checked and yielded a mean balance of $664 and a standard deviation of $297 (rounded to the nearest dollar). Find a 95% confidence interval for the true mean checking account balance for local customers.

6. (5 points each) Suppose X_1, X_2, ..., X_{10} is a random sample from a population that follows a ND(μ, σ) distribution. Define the following statistic:

$$E = [X_1 - 2X_2 + 3X_3 - 4X_4 + 5X_5]/3.$$

a) Show that E is unbiased for μ.

b) Find E's standard deviation.
   Remember: $Var(k_1X + k_2Y) = k_1{}^2Var(X) + k_2{}^2Var(Y)$, provided X & Y are independent.