Math 50 Stat Inf: Homework 3

due Wed Jan 25

Problems now from **LM4** unless indicated. I think you will find a lot of quick questions here, so don't be discouraged by the number.

3.7 : 40.

"Suppose that each of two urns has four chips numbered 1 through 4. A chip is drawn from the first urn and bears the number X. That chip is added to the second urn. A chip is then drawn from the second urn. Call its number Y. a) Find $p_{X,Y}(x, y)$, b) Show that $p_X(k) = p_Y(k) = 1/4$, $k = 1, 2, 3, 4$. c) Show that X and Y are not independent."

3.8 : 1 (please explain how the key algebra step works in a), [a is same as LM3 3.7.17, b asks the same question for $p_X(k) = p_Y(k) = (1-p)^{k-1}p$, $k = 1, 2, \dots$]

2 (easy but elegant) [LM3 3.7.19]

7a (figuring limits within which f's are 1 is hard)

"Find the pdf of XY for $f_X(x) = 1$, $0 \le x \le 1$, and $f_Y(y) = 1$, $0 \le y \le 1$, where X and Y are independent."

9 (you may be fed up of integrating $x^2 e^{\alpha x}$, if so look up a *table of integrals*).

"Suppose X and Y are indep with $f_X(x) = xe^{-x}$, $x \ge 0$ and $f_Y(y) = e^{-y}$, $y \ge 0$. Find the pdf of Y/X."

3.9 : 3,

"Suppose $f_{X,Y}(x, y) = (2/3)(x + 2y)$, $0 \le x \le 1$, $0 \le y \le 1$. Find $E(X + Y)$."

6,

"Suppose the the daily closing price of stock goes up an eihgth of a point with probability p and down with probability q, where $p > q$. After n days how much gain can we expect the stock to have achieved? Assume that the daily price fluctuations are independent events."

10 (ignore the hint),

"Suppose that X and Y are both uniformly distrubted over the interval $[0, 1]$. Calculate the expected value of the square of the distance of the random point (X, Y) from the origin; that is, find $E(X^2+Y^2)$."

16 (careful with variance) [LM3 3.13.5]

3.10 : 1 [LM3 3.8.1],

3 [LM3 3.8.3],

8 [LM3 3.8.8]. [Solve the problem on paper first. Then use matlab or some other graph-plotting package to print these three graphs on the *same* axes. Note Y_2 just has the pdf f_Y; don't ask me why they picked 2 here. Hint for matlab: set up a set of y values first, `y = 0:0.01:1` Then compute the list of `f` values from this, *e.g.* if $f(y)$ were y^2, then you'd do `f = y.^2`. Note the `.^` operator takes *each element* of the list `y` to the desired power. Then `plot(f, y)`, and `hold on;` lets you overplot on same axes. Consult matlab guides or ask if stuck].

3.11 : 2,

"Supose a die is rolled six times. Let X be the total number of 4's that occur and let Y be the numb er of 4's in the first two tosses. Find $p_{Y|x}(y)$."

5 [LM3 3.9.6],

16,

"Suppose X and Y are distributed according to the joint pdf $f_{X,Y}(x,y) = (2/5)(2x+3y)$, $0 \leq x \leq 1$, $0 \leq y \leq 1$. Find a) $f_X(x)$, b) $f_{Y|x}(y)$, c) $P(1/4 \leq Y \leq 3/4 \mid X = 1/2)$, d) $E(Y|x)$."

19 [LM3 3.9.16]

4.2 : 1 [LM3 same],

5 [LM3 same],

10 [LM3 same],

17 [LM3 4.2.16] (easy).