Math/stat 302 102[1] September Worksheet 4

http://www.math.ubc.ca/~ athreya/302

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1. Let us roll a die two times. Let X denote the average of the two numbers that appears on top.
   (a) What are the values X takes ?
   (b) Is X discrete ?
   (c) Find E(X).

2. Suppose X a continuous random variable has the proability density function

$$f(x) = \begin{cases} k(-x^2 + 7x - 12) & 3 \leq x \leq 4 \\ 0 & \text{otherwise,} \end{cases}$$

   where k is a constant. Then find:
   (a) What is the value of k ?
   (b) $F(y) = P(X \leq y)$. for all values of y. F is called the distribution function of X.
   (c) What is the meaning of $F(b) - F(a)$?
   (d) Find $E(X)$ and σ^2.

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[1] **Office hours:** Monday:2:00-3:00pm, Tuesday:10:30-11:30, 3:30-4:30 pm

Some practice problems on Chapter 3

1. Suppose two teams play a series of games, each producing a winner and a loser, until one team has won two more games than the other. Let G be the total number of games played. Assuming each team has chance 0.5 to win each game, independent of results of the previous games.

   (a) Find the probability mass function of G.

   (b) Find the expected value of G.

2. Consider the following conjecture: If X and Y are random variables, then $E(XY) = E(X)E(Y)$. (a) Provide an example to show the conjecture is false.

   (b) Prove that the conjecture is true if we make the further assumption that X and Y are independent.

3. Consider the following conjecture: If X is a random variable, and g is a function, then $E(g(X)) = g(E(X))$. Provide an example to show the conjecture is false.

4. A book has 200 pages. The number of mistakes on each page is a Poisson random variable with mean 1, and is independent of the number of mistakes on all other pages.

   (a) What is the chance that there are at least 2 mistakes on the first page ?

   (b) What is the chance that the first 5 pages has at least 2 mistakes in total ?