ECE 5510 Fall 2009: Homework 2

Due: at 5pm in the homework locker, Thursday, September 10

1. Y&G 1.5.4. You'll need to do 1.4.3 first.
2. Y&G 1.6.4
3. Y&G 1.7.4
4. Y&G 1.7.10 (A good lead into Bernoulli random trials)
5. A combinatorical interpretation of a mathematical identity:
   (a) k balls are selected at random from a box containing n red balls and m black balls. Compute $P\left[r \text{ of the } k \text{ balls are red}\right]$.
   (b) Use the result of (a) to compute the sum,
   $$\binom{n}{0}\binom{m}{k} + \binom{n}{1}\binom{m}{k-1} + \cdots + \binom{n}{k}\binom{m}{0}$$
6. Taken from A.W. Drake, *Fundamentals of Applied Probability Theory*, 1967.
   - Die A has 5 olive faces and 1 lavender face.
   - Die B has 3 olive faces and 3 lavender faces.
   - However awful their face colors may be, both dice are known to be fair.
   - A fair coin is flipped once. Then,
     - If it falls heads, throw die A $n+1$ times.
     - If it falls tails, throw die B $n+1$ times.

   (a) Compute $P\left[n^{th} \text{ throw of whichever die is used is olive}\right]$.
   (b) Compute $P\left[n^{th}\, and\, (n+1)^{st} \text{ throws of the die are both olive}\right]$.
   (c) Given that the first n throws of the die all resulted in olive, compute the conditional probability that the $(n+1)^{st}$ throw will result in olive. Interpret your result for large n.