ECE531 Homework Assignment Number 1

Due by 8:50pm on Wednesday 26-Jan-2011

Make sure your reasoning and work are clear to receive full credit for each problem.

1. 2 points. Suppose that a game of basketball is played between two slightly-mismatched teams. Team A makes its shots 49% of the time and Team B makes its shots 51% of the time. Assume that the outcome of each shot is independent of all other shots and that the team who makes the most shots during the game wins. If each team takes 100 shots in a game, what is the probability that Team A will win this game?

2. 4 points. Suppose you board a bus leaving Worcester at time T_1, where T_1 is a random variable uniformly distributed between 4:00pm and 6:00pm. The trip from Worcester to Boston takes an amount of time τ, where τ is uniformly distributed between 1 and 2 hours, regardless of when the bus leaves Worcester. When you arrive in Boston, either a taxi is immediately available or you must wait one hour for your taxi. Both events occur with equal likelihood, no matter when you arrive. Let T_2 be the time at which you get a taxi.

   (a) 2 points. Neatly draw the probability density function of T_2. Label all aspects of the pdf.

   (b) 2 points. Given the event that you arrive in Boston before 6:00pm, what is the expected value of T_2?

3. 3 points. Suppose you have two random variables, X and Y, with joint density function

$$
\begin{aligned}
f_{XY}(x, y) \quad &= \quad A(x + y) \text{ when } 0 < x \le 1, \text{ and } 0 < y \le 1 \\
&= \quad 0 \text{ otherwise .}
\end{aligned}
$$

   (a) What is A?

   (b) Compute the marginal pdf $f_X(x)$.

   (c) Compute $P[X > 0.5 \,|\, Y > 0.5]$.

4. 4 points. Kay 1.1.

5. 4 points. Kay 1.2.

6. 4 points. Kay 1.4.

7. 4 points. Kay 1.5.