# Practice Exam EE416 Fall 2004

1. Find all conditions on $a, b, c, d$ so that

$$p(x) = a e^{-cx} + b e^{-dx}, \quad x \geq 0.$$

is a pdf.

2. Toss a fair coin 10 times, and count the number of heads, $c$. The tosses are iid. We play a game. You put in \$1, I put in \$W. You guess the number of heads, $c$.
What is your best guess?
What should W be so that the game is fair.
Fair is usually taken that your expected gain is \$0.
Comment: No calculators on test. You Pascals Triangle or otherwise.

3. You poll the class and find that of the $N = 30$ people, F like football, B like baseball. Estimate by an upper bound the probability that a person likes football or baseball.
Compute for $N = 30$ and
   (a) $F = 15, B = 25$
   (b) $F = 5, B = 7$. Just leave the fraction as result.

4. Let $\underset{\sim}{t}$ be an exponential RV with mean 1. Based on a coin toss ($P(H)=p=1-P(T)$), you are given $\underset{\sim}{y}=2\underset{\sim}{t}$ if H occurs, otherwise $\underset{\sim}{y}=\underset{\sim}{t}$.

Find $E(y)$ without knowledge of the result of the toss. How big can $E(y)$ be?

5. Let $\underset{\sim}{x}\geq 0$ be a positive RV $P(\underset{\sim}{x}<0)=0$. We know that

$$P(\underset{\sim}{x}>x)=e^{-x^2} \qquad x\geq 0$$

(1) find $P(\underset{\sim}{x}<1)$

(2) find $p(x)$, the pdf of $\underset{\sim}{x}$.