**Math 10 - Spring 2013**
**Homework 2**
Due April 8, 2013

*The generation of random numbers is too important to be left to chance.*—Robert R. Coveyou.

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**Turn in:** Exercises 2.2, 2.10, 2.17, 2.24, 2.28, 2.30, 2.34, 2.39 from the textbook, and problems 9 and 10 below.

**9.** Suppose a random variable $X$ has a continuous probability density function given by the peicewise defined function:

$$f(x) = \begin{cases} x & 0 \leq x \leq 0.5 \\ 0.5 & 0.5 \leq x \leq 2 \\ 2.5 - x & 2 \leq x \leq 2.5 \\ 0 & \text{otherwise} \end{cases}$$

a. Make a plot of this probability density function.
b. Check that it is a valid probability density function.
c. What is the expected value of X?
d. What is the probability that X is less than 1?

**10. The Truel** Three men, Mr. White, Mr. Gray, and Mr. Black have a score to settle, and so they decide to engage in a three way duel (a Truel). Mr. White is a rather poor marksman who hits his target only 1/3 of the time. In contrast, Mr. Gray is successful 2/3 of the time, and Mr. Black is an expert marksman who never misses. Because of this disparity, they agree that Mr. White shall shoot first, followed by Mr. Gray, followed by Mr. Black, and this sequential rotation shall continue until only one man remains standing.

Although Mr. White isn't so good with a gun, he is an expert strategist, and surmises that Mr. Black will dispose of Mr. Gray first, since Mr. Gray poses more of a threat than Mr. White. By the same reasoning, Mr. White assumes that Mr. Gray will shoot at Mr. Black before shooting at Mr. White.

a. Assuming that this analysis holds true, what should Mr. White do on his first turn to maximize the chance that he will win? (Think outside the box...)

b. Assuming Mr. White uses the strategy of part (a) (Hint: His strategy will guarantee that he is still alive at the end of the first round!) and that the others also act in their own best interest, construct a probability tree to figure out the probability that Mr White is still alive at the end of the second round.