STA 4442/5440 Midterm 2 Practice
October 24, 2012

Name:

FSUID:

Please sign the following pledge and read all instructions carefully before starting the exam.

Pledge: I have neither given nor received any unauthorized aid in completing this exam, and I have conducted myself within the guidelines of the University Honor Code.

Signature: _____

INSTRUCTIONS:

- This is a closed-book, closed-notes exam. You may **not** refer to your notes, the text, or any other books. You may use a calculator.

- Total time is 70 minutes (11:05 A.M to 12:15 P.M.)

- **Show all work**, clearly and in order, if you want to receive full credit. When you use your calculator, explain all relevant mathematics. I reserve the right to take off points if I cannot see how you arrived at your answer (even if your final answer is correct).

- Circle or otherwise indicate your final answers.

- **Answer all the questions in the space provided. You may attach additional sheets if necessary.**

- This test has 4 problems and is worth 80 points. It is your responsibility to make sure that you have all of the problems.

- **Good luck!**

Prob. No.	Max Points	Earned Pts.
1	10	
2	10	
3	10	
4	10	
5	10	
6	10	

TOTAL: _____

Question 1. (10 pts.) The probability is 0.116 that an audit of a retail business will turn up irregularities in the collection of state sales tax. If 16 retail businesses are audited, defining a suitable random variable, find the expressions for the probability that

(a) exactly 5 will have irregularities in the collection of state sales tax.

(b) at least 1 will have irregularities in the collection of state sales tax.

(c) fewer than 5 will have irregularities in the collection of state sales tax.

(d) at most 5 will have irregularities in the collection of state sales tax.

(e) more than 5 will have irregularities in the collection of state sales tax.

(f) no more than 5 will have irregularities in the collection of state sales tax.

(g) no fewer than 5 will have irregularities in the collection of state sales tax

(h) Find an approximation for the expression in (b).

Question 2. (10 pts.) In actuarial science, one of the models used for describing mortality is

$$f(x) = \begin{cases} Cx^2(100 - x)^2, 0 \le x \le 100 \\ 0, \text{ otherwise} \end{cases}$$

where x denotes the age at which a person dies.

(a) Find the value of C.

b) Let A be the event "Person lives past 60." Find $P(A)$.

c) Find the expected mortality.

Question 3. (10 pts.) Suppose the pdf of a continuous random variable X is given by

$$f(x) = \begin{cases} \frac{1}{8} + \frac{3}{8}x, 0 \le x \le 2 \\ 0, \text{ otherwise} \end{cases}$$

a) Find the cdf $F(x)$.

b) $P(1 \le X \le 1.5)$.

Question 4. (10 pts.) Two species are competing in a region for control of a limited amount of a certain resource. Let X =proportion of resource controlled by one species and suppose $X \sim$ Unif($[0, 1]$). Let $h(X) = \max(X, 1 - X)$, then $h(X)$ is the amount of resource controlled by the superior species.

a) Find $E(h(X))$.

b) Find $Var(h(X))$.

Question 5. (10 pts.) Buses arrive at a specified stop at 15-minute intervals starting at 7 a.m. That is, they arrive at 7, 7:15, 7:30, 7:45, and so on. If a passenger arrives at the stop at a time that is uniformly distributed between 7 and 7:30, find the probability that she waits

(a) less than 5 minutes for a bus.

(b) more than ten minutes for a bus.

Question 6. (10 pts.) A point is picked randomly from the interval $[0, L]$.

(a) Define suitably a random variable X denoting the ratio of the length of the shorter and the longer interval formed.

(b) Find $P(X > 0.5)$.

(c) Find $E(X)$.