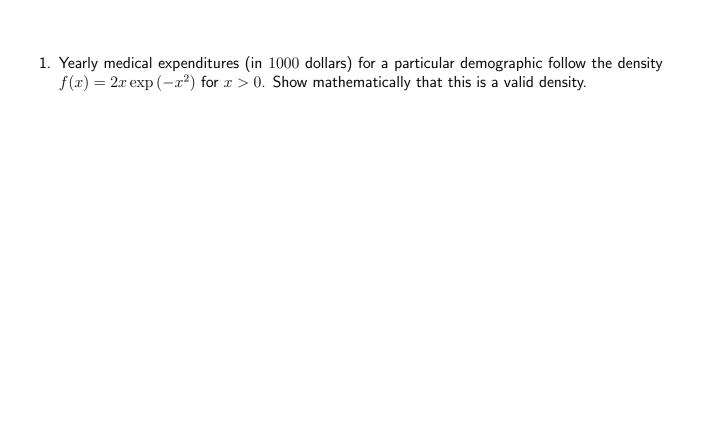
BST	140.651	Midterm	Exam

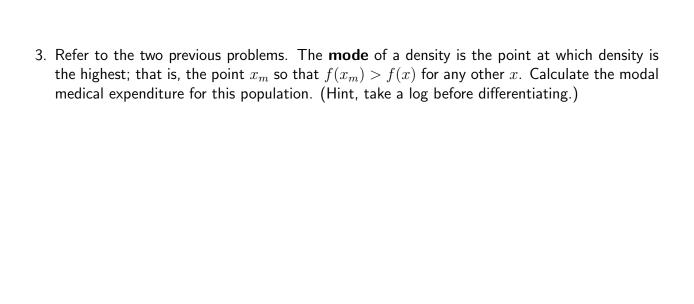
Notes:

- Show your work on all questions. Simple "yes" or "no" answers will be graded as if blank.
- Please be neat and write legibly. Use the back of the pages if necessary.
- There are eight questions.
- Good luck!

signature and **printed name**



2.	Refer to the previous problem. What is the median level of expenditure in this population? (Note, do not solve for a final number, just carry the mathematics until the point of solving for a final number.)



4. Let X_1 and X_2 be iid random variables from a population with mean μ_1 and variance σ_1^2 and Y_1 and Y_2 be iid random variables from a population with mean μ_2 and variance σ_2^2 . What is the **expected value** of $(X_1+X_2)^2+(Y_1+Y_2)^2$?

5. Let X be a random variable, draw the density f(x)=2x for $0\leq x\leq 1$. Calculate E[X] and $E[X^2]$.

6.	An HIV antibody test is known to be 90% sensitive and 80% specific. By what factor are the prior odds of disease increased with a positive test result? By what fraction are the prior odds of disease decreased with a negative test result?

7. Three events, A, B and C all have the same probability of occurrence; call this probability p. Argue that the probability of at least one occurring is less than or equal to 3p. (You may assume any result proved in class or in the homework.)

8. Consider a diagnostic test for tumors that yields two possible diagnoses, T for tumor and T^c for no tumor. Potential tumors for this cancer are always one of: malignant (D_M) , benign (D_B) or not tumors (D_n) . Argue the generalized version of Bayes rule:

$$P(D_M \mid T) = \frac{P(T \mid D_M)P(D_M)}{P(T \mid D_M)P(D_M) + P(T \mid D_B)P(D_B) + P(T \mid D_N)P(D_N)}.$$

You may use any result proved in class or in the homework.