

Final Exam

Math 362
9/27/10

Name: _____

Read all of the following information before starting the exam:

- READ EACH OF THE PROBLEMS OF THE EXAM CAREFULLY!
- Show all work, clearly and in order, if you want to get full credit. 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).
- A single $8\frac{1}{2} \times 11$ sheet of notes (double sided) is allowed. Calculators are permitted.
- Circle or otherwise indicate your final answers.
- Please keep your written answers clear, concise and to the point.
- This test has . problems and is worth 100 points. It is your responsibility to make sure that you have all of the pages!
- Turn off cellphones, etc.
- READ EACH OF THE PROBLEMS OF THE EXAM CAREFULLY!
- Good luck!

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1. (20 points) Suppose $f(x; \theta) = e^{p(\theta)K(x)}$ for some functions p , K and X_1, \dots, X_n are a sample for $f(x; \theta)$. Find a sufficient statistic for θ . Give a criteria on p and K for this to be complete.

2. (20 points) Suppose X_1, X_2 and X_3 are a sample from a $Poisson(\theta)$ distribution. Let $Z = X_1$ and $Y = X_1 + X_2 + X_3$. **a.** (10 pts) Compute $\mathbb{E}[Z|Y]$.

b. (10 pts) Compute $\mathbb{E}[Z]$ and $\mathbb{E}[Z|Y]$ along with $\text{Var}(Z)$ and $\text{Var}(\mathbb{E}[Z|Y])$.

3. (20 points) **a.** (10 pts) Suppose X_1, \dots, X_n have the $N(\mu, \theta)$ distribution, where μ is unknown. Let $S^2 = \frac{1}{n-1} \sum (X_i - \bar{X})^2$. Find the most powerful test of $H_0 : \theta = 1$ versus $H_1 : \theta = 2$.

Hint: Recall that you know the distribution of S^2 .

b. (10 pts) Suppose X_1, \dots, X_n have the $N(\theta, 1)$ distribution. Is there a uniformly most powerful test of $H_0 : \theta = 0$ versus $H_1 : \theta \neq 1$.

4. (20 points) Consider the two loss functions $L_1(x, \theta) = (x - \theta)^2$ and $L_2(x, \theta) = |x - \theta|$ and their associated risk functions $R_1(x, \theta)$ and $R_2(x, \theta)$. For a random variable X , which is larger $R_1(x, \theta)$ or $R_2(x, \theta)^2$ and why?

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