Statistics 630 - Assignment 11

(due Tuesday, December 9, 2014, 11:59 pm)

Instructions:

- The textbook exercises are in the book by Evans and Rosenthal. This assignment covers the material on hypothesis testing from Chapters 6 and 8 discussed in Lectures 36–40.
- Whether you write out the solutions by hand or in a text document, be sure that they are *neat, legible and in order* (even if you choose to solve them in a different order).
- **Type** your name, email address, course number, section number and assignment number at the top of the first page (or cover page).
- Either scan or print your solutions to a **PDF** file under 15MB in size. It must be in a *single* file, not separate files for separate pages. Name the file using your name (for example, I could use twehrly630hw01.pdf) to avoid confusion with other students and/or assignments. *Do not* take a photo of each page and then paste them into a document – this will make your file too big and the results will generally not be very readable anyway.
- Login to your WebAssign account to upload your file. You must do this by **11:59 pm U.S. Central time**, *according to the WebAssign server*, on the due date. We highly recommend that you start the upload at least 15 minutes earlier. You can make multiple submissions, but *only the last submission will be graded.*

Answer the following problem from Chapter 6:

6.3.1 (Assess the hypothesis using a $P-$value, but omit finding the confidence interval)

6.3.2 (same instructions)

6.3.8 (compute the p-values for both the Wald and score statistics but omit the confidence intervals.)

Answer the following problem from Chapter 8:

8.2.16 (The problem should read "where $\sigma_1^2 > \sigma_0^2$." You may set $\mu_0 = 0$ to simplify calculations.) Change the question at the end to "Is this test UMP size α for $H_0 : \sigma^2 = \sigma_0^2$ versus $H_a : \sigma^2 > \sigma_0^2$?"

8.2.20 Change the question at the end to "Is this test UMP size α for $H_0 : \lambda = \lambda_0$ versus $H_a : \lambda > \lambda_0$?"

Additional Problems:

A. In the setting of problem 8.2.20, derive the likelihood ratio, Wald, and score statistics for testing $H_0 : \lambda = \lambda_0$ versus $H_a : \lambda \neq \lambda_0$.

B. In the setting of 8.2.16, derive the level α LR test for $H_0 : \sigma^2 = \sigma_0^2$ versus $H_a : \sigma^2 \neq \sigma_0^2$.

C. Consider the model in problem 6.2.19 on page 319. Suppose that $x_1 = 10,\ x_2 = 68$, and $x_3 = 112$ individuals of the three genotypes are observed.

i. Obtain the mle of θ (you may use your answer to problem 6.2.19).

ii. Derive the LR ratio test of $H_0 : \theta = 1/2$ versus $H_a : \theta \neq 1/2$.

iii. Carry out the LR test at level $\alpha = 0.05$ for the above data.

D. On slides 79 and 80 of Chapter 6, a confidence interval for the variance of a normal distribution was derived. Use Theorem B on slide 51 to derive the acceptance region for testing the hypothesis $H_0 : \sigma^2 = \sigma_0^2$ at level α based on a sample $X_1, \ldots, X_n$. Precisely describe the rejection region if $\sigma_0 = 2,\ n = 16,\ \alpha = 0.05$ using the equal-tail-area critical values.