Homework 8, Math 181A Winter 2023

Due by Saturday noon, March 11 (pacific time).

Relevant section in textbook by Larsen and Marx: 7.2, 7.3, 7.4, 7.5

Relevant lecture notes: Lecture 19, Lecture 20 and Lecture 21.

Problem 1: Larsen and Marx question 7.4.12.

Problem 2: Larsen and Marx question 7.4.20. Make the decision in two ways using the t-table in Appendix A.2: (1) finding the critical region; (2) finding the range of the p-value. **Note:** the sample mean and sample standard deviation of the 34 ratios in the table are 0.6373 and 0.14139 respectively.

Problem 3: Larsen and Marx question 7.4.21. Make the decision in two ways using the t-table in Appendix A.2: (1) finding the critical region; (2) finding the range of the p-value.

Problem 4: Larsen and Marx question 7.5.8.

Problem 5: Larsen and Marx question 7.3.4.

Problem 6: Suppose $X_1, \ldots, X_n$ are i.i.d. random variables having a $N(\mu, \sigma^2)$ distribution. Consider the estimator of σ^2,

$$\hat{\sigma}_c^2 = c \sum_{i=1}^{n} (X_i - \bar{X})^2.$$

Recall that $\hat{\sigma}_c^2$ is the MLE if $c = 1/n$ and is the unbiased estimator S^2 if $c = 1/(n-1)$.

(a) Calculate the mean squared error of $\hat{\sigma}_c^2$.

(b) For which value of c is the mean squared error the smallest?