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Homework 5
Math 181B, UCSD, Spring 2018
Due on Thursday, 17th May in class

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Complete the following questions of the textbook from Larsen & Marx:

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$(5^{\text{th}}$ edition)

Section	Page	Questions
14.2	661-662	4, 5, 7, 10, 11

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In addition, complete the following exercises:

Exercise 1

Suppose that n measurements are to be taken under a treatment condition and another n measurements are to be taken independently under a control condition. It is thought that the standard deviation of a single observation is about 10 under both conditions (known σ). How large should n be so that the test of $H_0 : \mu_X = \mu_Y$ vs $H_1 : \mu_X > \mu_Y$ has a power of $1/2$, if the true value of the difference of means $\mu_X - \mu_Y = 2$ and $\alpha = 1\%$?

Exercise 2

Compute the likelihood ratio test for the two sample problem

$$H_0 : \lambda_1 = \lambda_2 \text{ vs } H_1 : \lambda_1 \neq \lambda_2$$

where the two samples of size n and m came from Exponential distribution with parameters λ_1 and λ_2, respectively.

Exercise 3

Consider $X_1, \ldots, X_n \sim_{iid} f_\theta$, where

$$f_\theta(x) = (1 - \theta)\mathbf{1}_{(-0.5,0]}(x) + (1 + \theta)\mathbf{1}_{(0,0.5)}(x),$$

and $\theta \in \mathbb{R}$ is an unknown parameter.

1. What conditions must θ verify?

2. Find the maximum likelihood estimator $\hat{\theta}_{MLE}$ of θ.

3. Under the conditions of part 1, is $\hat{\theta}_{MLE}$ unbiased? consistent? asymptotically normal?