Homework 3, Math 181A Winter 2023

Due by Saturday noon, January 28 (pacific time).
Relevant section in textbook by Larsen and Marx: 5.3, 5.4.
Relevant lecture notes: Lecture 5, Lecture 6 and Lecture 7.

Problem 1:
(a) Larsen and Marx question 5.3.2.
(b) Larsen and Marx question 5.3.10.

Problem 2: Larsen and Marx question 5.3.26.

Problem 3: Suppose $X_1, \ldots, X_n$ is a random sample from a Bernoulli(p) distribution and the sample average is $\bar{x}_n = 0.45$, based on which we can construct a 95% confidence interval for p. Now we collect more data and the sample average is around 0.48, we want to construct a 90% confidence interval with the length being 1/3 of the 95% one. How large should the sample size n_{new} be in terms of n?

Problem 4: Larsen and Marx question 5.4.6.

Problem 5: Larsen and Marx question 5.4.9.

R simulation:
For $n = 20$, simulate a random sample of size n from $N(\mu, 2^2)$, where $\mu = 1$. Note that we just use $\mu = 1$ to generate the random sample. In the problem below, μ is an unknown parameter. Plot in different figures:

(a) the likelihood function of μ,
(b) the log likelihood function of μ.

Mark in both plots the maximum likelihood estimate of μ from the generated random sample.