

# MATH 252-01: Probability and Statistics II

## Problem Set 3

Assigned 2019 January 29  
Due 2019 February 7

Show your work on all problems! If you use a computer to assist with numerical computations, turn in your source code as well.

### 1 Devore Chapter 7, Problem 44

### 2 Devore Chapter 8, Problem 12

*Note that problem 8.12 is different in the eighth and ninth editions of Devore. Be sure to do the problem from the ninth edition.*

### 3 Devore Chapter 8, Problem 18

*Note that problem 8.18 is different in the eighth and ninth editions of Devore. Be sure to do the problem from the ninth edition.*

### 4 Computational Exercise

Consider a sample of size  $n = 10$  drawn from a normal distribution, and let the null hypothesis be  $\mu = 0$ . Let the null hypothesis  $H_0$  be  $\mu = 0$ , and consider tests with false alarm (type I error) probability  $\alpha = 0.05$ . Suppose the population standard deviation  $\sigma$  is known to be 2.5. Plot the false dismissal (type II error) probability  $\beta(\mu)$  as a function of the true population mean  $\mu$  from  $\mu = -3$  to  $\mu = 3$ , and obtain the numerical values of  $\beta(-3)$ ,  $\beta(-1)$ ,  $\beta(0)$ ,  $\beta(1)$ ,  $\beta(2)$ , and  $\beta(3)$  for the following tests:

- An upper-tailed test appropriate to an alternative hypothesis  $H_a: \mu > 0$ .
- A lower-tailed test appropriate to an alternative hypothesis  $H_a: \mu < 0$ .
- A two-tailed test appropriate to an alternative hypothesis  $H_a: \mu \neq 0$ .

Note that in minitab this can be done with “Stat>Power and Sample Size”. Comment on the value of  $\beta(\mu)$  in the cases where the sign of  $\mu$  is inconsistent with the alternative hypothesis.