MATH 252-01: Probability and Statistics II

Problem Set 5

Assigned 2016 September 27
Due 2016 October 4

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 8, Problem 44
2 Devore Chapter 8, Problem 50
3 Devore Chapter 8, Problem 78
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:

a. An upper-tailed test appropriate to an alternative hypothesis \( H_a: \mu > 0 \).

b. A lower-tailed test appropriate to an alternative hypothesis \( H_a: \mu < 0 \).

c. 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.