Stat 202  
Practice Power Problems

Note: The only test situation where you will be responsible for calculating power is for a one-sided \( z \)-test involving a population mean.

1. Text Problem 10.77

2. Consider the famous Extendabulb example where we’re testing \( H_0: \mu \leq 1,030 \) vs. \( H_1: \mu > 1,030 \). The specified level of significance in this example was given as \( \alpha = 0.05 \) and the sample size was \( n = 40 \) and the population standard deviation was known to be \( \sigma = 90 \).

(a) Suppose that we decide that we’re not willing to run a 5\% chance of making a Type I error, so we decide to instead use \( \alpha = 0.01 \). Find the test’s decision rule in terms of the \( z \)-statistic and then in terms of the sample mean \( \bar{X} \).

(b) Calculate the power of the test from Part (a) when \( H_1 \) is true and \( \mu \) is really equal to 1,050. Interpret your result.

(c) Calculate the power of the test from Part (a) when \( H_1 \) is true and \( \mu \) is really equal to 1,070. Interpret your result.

Solutions to Problem 2

(a) Reject \( H_0 \) if \( z > 2.33 \); reject \( H_0 \) if \( \bar{X} > 1,063.2 \).

(b) 0.1762 (Appropriate \( z \)-value was 0.93) Interpret: If the mean lifetime for the new bulbs is 1,050 hours (20 hours better than the old bulbs) there is about an 18\% chance that our test would detect this and reject \( H_0 \).

(c) 0.6844 (\( z \)-value = -0.48) If the mean lifetime for the new bulbs is 1,070 hours (40 hours better than the old bulbs) there is about an 68\% chance that our test would detect this and reject \( H_0 \).