

Math 5301 Homework 9

Do the following problems using R.

1. In a sample of 10 parts produced by a machine, 4 were defective. Let p be the proportion of defective parts produced by the machine, and consider the testing problem

$$H_0 : p \leq 0.05 \text{ vs. } H_1 : p > 0.05,$$

where $\alpha = 0.05$.

- (a) Find the critical region for this test and the p -value using Table A3.
 - (b) Find the p -value using the `pbinom` command.
 - (c) Find the p -value using the `binom.test` command. Note that you will need to provide arguments for `p` and `alternative`.
 - (d) Find the exact 95% confidence interval for p using Table A4.
 - (e) Find the exact 95% confidence interval for p using the `binom.test` command (don't provide an argument for `alternative` on this problem, because that will give you a one-sided confidence interval).
 - (f) Find the power for this test for $p = 0.00, 0.01, 0.02, 0.03, \dots, 0.99, 1.00$. Use these values to sketch a curve of power vs. p .¹
 - (g) Plot the power curve when $n = 100$ and $n = 1000$, and plot all three power curves in the same graph.²
2. Use the `mcnemar.test` command to perform the test in Example 1 on p. 168. To do this, store the given 2×2 table in a matrix A , and then use the command `mcnemar.test(A)`.

¹Hints: First, create the vector `p=seq(from = 0, to=1, by=0.01)`. For this problem, the critical region is $[T > 2]$, so the power for any given value of $p[i]$ is $P(T > 2 \mid p[i])$, calculated in R as `1-pbinom(2, size=10, prob=p[i])`. Given two vectors x and y , a plot of y vs. x connected by solid lines is obtained with the command `plot(x, y, type='l')`.

²Hint: If you have a plot open in R, the command `lines(x, y)` will add the plot of y vs. x connected by solid lines to the existing plot.