

UNIVERSITY OF ILLINOIS AT CHICAGO
Mechanical Engineering

IE 446
Problem Set #5

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Reading: Montgomery, Sections 5-1 and 5-2.

This is meant to be a short homework assignment. The point total is 10, while the other homework assignments total 20 points each.

1. This is an exercise in using the computer to find P -values (and other things you may want to know). I recommend `matlab`, but you are welcome to use any software that will give you sufficiently precise answers. Remember, if you choose to use `matlab`, you can get a list of all the statistical functions by using

```
>> help stats
```

Some functions of interest will be the pdf, cdf, and inv functions (*e.g.*, `normpdf`, `normcdf`, and `norminv` for the normal distribution; the χ^2 , t , and F distributions have their analogs). You can get help on any function with:

```
>> help functionname
```

You may want to set the output to the long format:

```
>> format long
```

If you just want to explore, try the graphical tool `disttool`.

Please give all answers to six (6) decimal places. Tell me what your input is for each question (attached print-outs are fine).

- (a) For the normal distribution, what value of α gives $Z_\alpha = 2.15$? In other words, what is the P -value for a (one-sided) test with test statistic $Z_0 = 2.15$?
 - (b) For the t distribution with six degrees of freedom ($\nu = 6$), what value of α gives $t_{\alpha,\nu} = 2.15$? In other words, what is the P -value for a (one-sided) test with test statistic $t_0 = 2.15$?
 - (c) For the χ^2 distribution with six degrees of freedom ($\nu = 6$), what value of α gives $\chi^2_{\alpha,\nu} = 2.15$? Why is this number so different from the last two problems?
 - (d) For the F distribution with thirteen numerator degrees of freedom ($\nu_1 = 13$) and nine denominator degrees of freedom ($\nu_2 = 9$), what value of α gives $F_{\alpha,\nu_1,\nu_2} = 2.15$? This answer will tell you what the P -value is for a test on the ratio of variances where $F_0 = 2.15$, for example.
 - (e) (optional, not included in grade) For each of (a)–(d) above, think of an example of what the hypotheses you are testing might be.
2. Montgomery 5-2. I didn't want to type in all that data; look at the book.