Directions:

1. All the problems below are to be solved using IPython Notebook (Jupyter).

2. All the problems should be solved in one single IPython Notebook file.

3. Create a new folder exam2<your full name> and do all your exam related work inside this new folder. If you have a functions file then please copy this file into this folder. You should name your IPython notebook (Jupyter) file exam2<your full name>.ipynb. After you finish the exam convert your exam2<your full name>.ipynb into html or pdf, and zip your folder exam2<your full name> with all the files inside it. Upload this zipped folder to https://dropitto.me/m50f15.

5. Please do not use internet for any other purpose except for downloading the data.

6. Use of handwritten or printed notes or textbook is prohibited during the exam.

1. Copier maintenance. The Tri-City Office Equipment Corporation sells an imported copier on a franchise basis and performs preventive maintenance and repair service on this copier. The data below have been collected from 45 recent calls on users to perform routine preventive maintenance service; for each call, X is the number of copiers serviced (column 2 in the data) and Y is the total number of minutes spent by the service person (column 1 in the data).

Data source: https://netfiles.umn.edu/users/nacht001/www/nachtsheim/Kutner/Chapter%20%201%20Data%20Sets/CH01PR20.txt

This data can also be accessed using the function read_tb_data(ch,pr) *with ch=1 and pr=20.*

(a) The manufacturer has suggested that the mean required time should not increase by more than 14 minutes for each additional copier that is serviced on a service call. Conduct a test to decide whether this standard is being satisfied by Tri-City. Control the risk of a Type I error at .05. State the alternatives, decision rule, and conclusion. What is the P-value of the test?

(b) Plot the regression line and the 90 percent confidence band for the regression line on a scatter plot of (X,Y). Also, obtain a 90 percent prediction interval for the service time on the next call in which six copiers are serviced.

(c) Conduct the Breusch-Pagan test to determine whether or not the error variance varies with the level of X. Use $\alpha = .05$. State the alternatives, decision rule, and conclusion.

(d) Prepare a normal probability plot of the residuals. Also obtain the coefficient of correlation between the ordered residuals and their expected values under normality. Does the normality assumption appear to be tenable here? Use $\alpha = .05$.

(e) What are the alternative conclusions when testing for lack of fit of a linear regression function? Perform the test. Control the risk of Type I error at .05. State the decision rule and conclusion.

[Points: 15]