STAT 2131:
Applied Statistical Methods I
HW #3
Due Thursday, Sep 10

1. KNNL 3.14. See slides 15-18 of Lecture 5 for a review of how to apply an F test when X takes discrete values.

2. KNNL 3.18. The data for this problem has been uploaded to blackboard. In part d, a normal probability plot refers to a normal Q-Q plot (standard normal quantiles vs. data quantiles).

3.14. Refer to **Plastic hardness** Problem 1.22.

a. Perform the F test to determine whether or not there is lack of fit of a linear regression function; use $\alpha = .01$. State the alternatives, decision rule, and conclusion.

b. Is there any advantage of having an equal number of replications at each of the X levels? Is there any disadvantage?

c. Does the test in part (a) indicate what regression function is appropriate when it leads to the conclusion that the regression function is not linear? How would you proceed?

3.18. **Production time.** In a manufacturing study, the production times for 111 recent production runs were obtained. The table below lists for each run the production time in hours (Y) and the production lot size (X).

i:	1	2	3	...	109	110	111
X_i:	15	9	7	...	12	9	15
Y_i:	14.28	8.80	12.49	...	16.37	11.45	15.78

a. Prepare a scatter plot of the data. Does a linear relation appear adequate here? Would a transformation on X or Y be more appropriate here? Why?

b. Use the transformation $X' = \sqrt{X}$ and obtain the estimated linear regression function for the transformed data.

c. Plot the estimated regression line and the transformed data. Does the regression line appear to be a good fit to the transformed data?

d. Obtain the residuals and plot them against the fitted values. Also prepare a normal probability plot. What do your plots show?

e. Express the estimated regression function in the original units.