- Due: November 15, Wednesday, 11:59PM
- How to submit: via Blackboard. If you have multiple files, upload a zipped file
- Submission link will disappear after 48 hours
- Homework solution is not required to be typed, but must be legible.

Problem 1 Consider the dataset in Table 6.9 from the TEXT (Table 6.9 is attached). First use ordinary least square (OLS) to fit the transformed data

$$Y' = \frac{Y}{X}, \text{ and } X' = \frac{1}{X},$$

then use weighted least square (WLS) by having $w_i = \frac{1}{x_i^2}$ to fit the data. Report the coefficients $\hat{\beta}_0, \hat{\beta}_1$, and the R^2 obtained from two methods.

Problem 2 Consider a SLR model $y_i = \beta_0 + \beta_1 x_i + \epsilon_i$, where the error term has unequal variance $\text{Var}(\epsilon_i) = k^2 x_i^2$, and $k > 0$ is unknown.

1) Prove the equivalence of the WLS method with weight $w_i = \frac{1}{x_i^2}$ and the OLS method on the transformed data $Y' = \frac{Y}{X}$, and $X' = \frac{1}{X}$.

2) Find the variance of the $\hat{\boldsymbol{\beta}}$ resulting from the two methods, respectively.

Problem 3 Exercise 9.2 from the TEXT (Table 9.9 is attached).

Problem 4 Exercise 10.2 from the TEXT.

Problem 5 Consider the Longley's data in Table 10.19 (Table 10.19 is attached).

1) Compute the correlation matrix of the six predictors. Do you see any evidence of collinearity? How many different sets of collinearity exist in the data? What are the variables involved in each set of collinearity?

2) Transform the original model ($Y = \beta_0 + \beta_1 X_1 + \ldots + \beta_6 X_6 + \epsilon$) to the standardized model ($\tilde{Y} = \theta_1 \tilde{X}_1 + \ldots + \theta_6 \tilde{X}_6 + \epsilon'$).

3) Compute the principle components. Using Principle Component Regression, first regress $\tilde{Y}$ on all six principle components, provide the estimates of the coefficients θ_j in the standardized model; then decide which principle components you choose to retain and provide the estimates of the coefficients in the standardized model again.