

STA303H1-S: Methods of Data Analysis II
Assignment 1 - Question 2 **Due data February 3, 2023**

Student Name.....ID number.....

Instructions: *Show your answers in details.*

Q2 (12 points): Suppose that the growths of 56 algae in water (Y) were observed as a linear function of days (X_1) and dosage of silver metal (measured in mg) added into the water (X_2). The data is available in the file **data.hw1.csv** from the course Quercus site.

1. Estimate the coefficients of the following regression model

$$y_i = \beta_0 + \beta_1 x_{1i} + \beta_2 x_{2i} + \beta_3 x_{1i} x_{2i} + \varepsilon_i.$$

2. Test whether the overall model is a good for predicting the growth algae?
3. Test $H_0 : \beta_3 = 0$ versus $H_1 : \beta_3 \neq 0$. Do you have any reason to change the model given in part (1).
4. Using the model you adopted in part (3), make a test for lack of fit and draw conclusion.
5. Plot standardized residuals of your fitted model against X_1 and X_2 separately, and comment.
6. Calculate the variance inflation and check whether multicollinearity is an issue?