Homework 12.

(Due Dec. 8)

12.7.2 **Truck Unloading Times**
Consider the data set of the times taken to unload a truck at a warehouse given in DS 12.2.2. Plot the residuals against the temperature. Are there any points that might be considered to be outliers? Does the residual plot have any patterns that suggest that the fitted regression model is not appropriate? Construct and interpret a normal probability plot.

12.7.6 **Vacuum Transducer Bobbin Resistances**
Consider the data set of vacuum transducer bobbin resistances given in DS 12.2.6. Plot the residuals against the temperature. Are there any points that are possible outliers? Does the residual plot have any patterns that suggest that the fitted regression model is not appropriate?

12.8.4 **Synthetic Human Arteries**
In an experiment to investigate the suitability of using a silicone tube to model the behavior of a human artery, the data set in DS 12.8.4 is collected, which relates the pressure differential P across the walls of the tube to the cross-sectional area A of the tube.

(a) Show that the model

$$P = \gamma_0 A^{\gamma_1}$$

appears to provide a good fit to the data set.

(b) Make a suitable transformation of the variables and find point estimates for γ_0 and γ_1.

(c) Calculate two-sided 95% confidence intervals for γ_0 and γ_1.

12.8.6 Explain how simple linear regression can be used to fit the model $e^{y/\gamma_0} = \gamma_1/x^2$. How would you find the parameter estimates $\hat{\gamma}_0$ and $\hat{\gamma}_1$?

⊙ For problem 12.9.4 and 12.9.8, what is the sample correlation coefficient r? Show that the t-statistic written in terms of the sample correlation coefficient $t = r\sqrt{n-2}/\sqrt{1-r^2}$ is equal to the t-statistic $t = \hat{\beta}_1/\text{s.e.}(\hat{\beta}_1)$ calculated earlier.

12.9.4 **Truck Unloading Times**
The data set of the times taken to unload a truck at a warehouse given in DS 12.2.2.

12.9.8 **Vacuum Transducer Bobbin Resistances**
The data set of vacuum transducer bobbin resistances given in DS 12.2.6.

12.12.38 A simple linear regression analysis has $n = 20$ and $R^2 = 0.853$. What can you say about the p-value for the two-sided hypothesis test of $H_0 : \beta_1 = 0$?

12.12.40 In a simple linear regression analysis with $n = 20$ data points, the estimates $\hat{\beta}_0 = 123.57$, $\hat{\beta}_1 = -3.90$, and $\hat{\sigma} = 11.52$ are obtained, with $\sum_{i=1}^{20} x_i = 856$, $\sum_{i=1}^{20} x_i^2 = 37636$, $\sum_{i=1}^{20} y_i = -869$, and $\sum_{i=1}^{20} y_i^2 = 55230$.

(a) Construct a two-sided 95% prediction interval for a future response value when the input value is 40.

(b) Compute the analysis of variance table and calculate the coefficient of determination R^2.