

Assignment #12 — Due Friday, December 16 by 4:00 P.M.

Turn in homework to your TA's mailbox using this sheet as the cover page.

Fill in your name and also circle the *lecture section in which you are registered* and circle the *discussion section you expect to attend* to pick up this assignment.

Name:

Lecture 1 (Hanlon). **311:** Tu 1:00 - 2:15pm **312:** Th 8:00 - 9:15am **313:** We 1:00 - 2:15pm

Lecture 2 (Larget). **321:** Tu 1:00 - 2:15pm **322:** We 2:30 - 3:45pm **323:** We 1:00 - 2:15pm

Please answer the following questions.

1. For each statement, mark TRUE or FALSE. If FALSE, explain why or make a small change to correct it. Very brief explanations are sufficient.
 - (a) In a simple linear regression model, the equation of the fitted line is $\hat{Y} = 2.5 - 1.3X$. This implies that the correlation coefficient between X and Y is negative.
 - (b) A student uses paper and pencil and the textbook equations to calculate the correlation coefficient between two quantitative variables X and Y and finds $r = 1.06$. This implies a very strong linear relationship between X and Y .
 - (c) After fitting a simple linear regression model, a plot of residuals versus values of the explanatory variable exhibit an up/down/up pattern from left to right. This is evidence of nonconstant variance.
2. p. 503, Problem 13 in the textbook.
3. p. 503, Problem 19 in the textbook.
4. Read problem 23 on page 314 for the background. Researchers measured oxygen consumption in seals both for feeding and nonfeeding dives. A regression analysis of consumption in feeding dives versus nonfeeding dives is summarized below.

Coefficients:

	Estimate	Std. Error	t value	Pr(> t)
(Intercept)	16.7693	8.6483	1.939	0.0885 .
OxygenNonfeeding	1.2010	0.1124	10.681	5.18e-06 ***

Residual standard error: 6.542 on 8 degrees of freedom

Multiple R-squared: 0.9345, Adjusted R-squared: 0.9263

F-statistic: 114.1 on 1 and 8 DF, p-value: 5.18e-06

- (a) Use the regression equation to estimate the oxygen consumption for a feeding dive for a seal for which the oxygen consumption in a nonfeeding dive is 80.0.
- (b) Find a 95% confidence interval for the slope of the regression equation

$$(\text{Oxygen consumption in feeding dive}) = \alpha + \beta(\text{Oxygen consumption in nonfeeding dive})$$

(c) Which is wider:

- (1) a 95% confidence interval for the mean oxygen consumption in a feeding dive of all seals with a measure of 80.0 in nonfeeding dives;
- (2) a 95% prediction interval for the mean oxygen consumption in a feeding dive of a single seal with a measure of 80.0 in nonfeeding dives.

Explain briefly.

(d) Which is wider:

- (1) a 95% prediction interval for the mean oxygen consumption in a feeding dive of a single seal with a measure of 75.0 in nonfeeding dives.
- (2) a 95% prediction interval for the mean oxygen consumption in a feeding dive of a single seal with a measure of 50.0 in nonfeeding dives.

Explain briefly. (In the data set, the mean oxygen consumption in nonfeeding dives was 74.68.)

(e) The R^2 statistic is 0.9345. Find a numerical value for the correlation coefficient. How do you know if it is positive or negative?

(f) Answer true or false and explain briefly.

As the correlation coefficient is so close to one, there is a strong linear relationship between these variables and a nonlinear regression model could not significantly improve upon the linear regression model.
