

## MATH 356H

### Assignment #2

**Note:** Whenever possible, calculations may be done using R, Excel, TI83 or any other software.

1. Chapter 12, #32
2. Chapter 12, #37
3. A student, working on a summer internship in the economic research office of a large corporation, studied the relation between sales of a product ( $Y$ , in millions of dollars) and population ( $X$ , in millions of persons) in the firm's 50 marketing districts. The normal error regression model was employed. The student first wished to test whether or not a linear association between  $Y$  and  $X$  existed. The following is part of the output he obtained:

Parameter	Estimated value	95 percent	
		Confidence limits	
Intercept	7.43119	-1.18518	16.0476
Slope	.755048	.452886	1.05721

- (a) The student concluded from these results that there is a linear association between  $Y$  and  $X$ . Is the conclusion warranted? What is the implied level of significance?
  - (b) Someone questioned the negative lower confidence limit for the intercept, pointing out that dollar sales cannot be negative even if the population in a district is zero. Discuss briefly.
4. Chapter 12, #48.
  5. Chapter 12, #49.
  6. You work for a cellular phone industry analyst and gather the data shown in the following table:

Number of subscribers (in millions)	Average monthly bill (in dollars)
$x$	$y$
1.2	96.83
2.1	98.02
3.5	89.03
5.3	80.9
7.6	72.74
11.0	68.68
16.0	61.48
24.1	56.21
33.8	51
44	47.7
55.3	42.78
69.2	39.43
86.0	41.24

- (a) Draw a scatter plot of the cellular phone data. Using the scatter plot, what type of correlation (negative or positive), if any, do you think the data have?
- (b) Find an equation of the regression line of the data. Graph the regression line together with your scatter plot.
- (c) Use the regression line to obtain a 95% confidence interval for the true average monthly bill when  $x = 25$  million subscribers.
- (d) The analyst wants to use the regression line you found to predict the average monthly bill for  $x = 140$  million subscribers. Is a 95% prediction interval valid? If so, obtain it.
- (e) The analyst claims that the data have a significant correlation at  $\alpha = .01$ . Verify this claim.
- (f) Plot the residuals against the independent variable. Does your model seem appropriate? If not, fit a model that does seem appropriate.

7. Chapter 12, #58