Home Work 3-1

Numeric Problems:

1. Prior to being hired, the five salespersons for a computer store were given a standard sales aptitude test. For each individual, the score achieved on the aptitude test and the number of computer systems sold during the first 3 months of their employment are shown here.

	John	Cora	Sam	Cindy	Henry
Score on aptitude test	80	70	45	90	20
Units sold in 3 months	25	15	10	40	5

(a) Determine the least-squares regression line and interpret its slope.

(b) Estimate, for a new employee who scores 60 on the sales aptitude test, the number of units the new employee will sell in her first 3 months with the company.

(c) Find the standard error of estimate. (d) Find the r-square of the model.

2. McDonalds Corporation has reported the following values for total revenues and net income during the 1998 to 2005 period. All data are in billions of dollars: Source: McDonalds Corporation, 2005 Annual Report.

	1998	1999	2000	2001	2002	2003	2004	2005
Net Income	1.55	1.95	1.98	1.64	0.89	1.47	2.28	2.60
Total Revenues	12.42	13.26	14.24	14.87	15.41	17.14	19.07	20.46

(a) Determine the least-squares regression equation line for estimating net income and interpret its slope.

(b) For a year in which total revenues are $18.0 billion, estimate the net income for that year.

(c) Also find a 95% Confidence and Prediction Interval for the above estimate.

(d) Find the sample correlation coefficient for the model.

3. The accompanying table gives the peak power load for a power plant and the daily high temperature for a random sample of 10 days.

Day	1	2	3	4	5	6	7	8	9	10
High Temperature (F)	95	82	90	81	99	100	93	95	93	87
Peak Load	214	152	156	129	254	266	210	204	213	150

(a) Test the hypothesis that the population correlation coefficient ρ between peak power load and high temperature is zero versus the alternative that it is positive. Use $\alpha = 0.05$.

(b) What is the minimum absolute value of the sample correlation coefficient that will make the model significant at 5% level?

(c) Find a 98% confidence and prediction interval for high temperature of 95.

(d) For what value of high temperature the confidence interval will be shortest.

Algebraic Problem:

4. Consider the simple linear regression model based on normal theory. If we are interested in two different testing $H_0 : \beta_1 = 0 \quad vs \quad H_1 : \beta_1 \neq 0$ and $H_0 : \rho = 0 \quad vs \quad \rho :\neq 0$, then show that test statistic value in both the tests are equivalent (values are always same).

5. Consider our example of SLR model in class where X=listing Price and Y = Selling Price. Now first I fitted the model using the unit as dollars but then I change my data unit to \$100,000. It means that the data point $(x_i, y_i) = (\$102789, \$94, 300)$ in the first model will read as $(x_i, y_i) = (\$1.02789, \$0.94, 300)$ in the second model. Now the question is:

(1) How the estimated beta values will change from first model to second? Explain.

(2) How R^2 will change from first to second?

(3) How standard error will change from first to second.

(4) How the t-stat for β_1 will change?