Q1) The sales manager for Tide Corporation believes that the sales of the company’s famous Sunshine laundry detergent (S) are related to the company’s advertising expenditure (A), as well as the combined advertising expenditure of its four biggest competitor detergents (C). The sales manager collected 48 weekly observations on S, A, and C to estimate the following regression: S = a + bA + cC; where S, A, and C are measured in thousands of dollars per week. Tide’s sales manager is confident using the parameters that are statistically significant at 10 percent or better level.

(a) What sign does the sales manager expect a, b, and c to have?

 (b) Write the regression equation using the estimated coefficients, R2, F-stat, and t-statistics for all coefficients. Interpret the meaning of each coefficient from reported in the table?

 (c) Does Tide’s advertising expenditure have a statistically significant effect on the sales of Sunshine detergent? Explain using appropriate t-statics from the t-table form your textbook at 10 percent level of significance (remember you need to look for appropriate degree of freedom).

(d) Does advertising by its four largest competitors affect sales of Sunshine detergent in a statistically significant way? Explain using appropriate t-statistics from the table.

 (e) What fraction of the total variation in sales of Sunshine remains unexplained? What can the sales manager do to increase the explanatory power of the sales equation? What other explanatory variables might be added to the equation?

(f) What is the expected level of sales each week when Tide spends $40,000 per week and the competitors advertising expenditure for the four companies are $100,000 per week. The results of the estimation are: 

Q2) The demand for chicken wings is estimated by Slim Chicken in Kansas as: Q = a + b (Price) + c (Income) + e, The Least squares regression reveals that â = 8.27, 𝑏̂ = - 2.14, 𝑐̂= 0.36, 𝜎𝑎̂ = 5.32, 𝜎𝑏̂ = 0.41, and 𝜎𝑐̂= 0.22. R-squared is 0.35. (Note: ‘hat’ represents estimated coefficients. Sigma represents Standard deviations of the coefficient) Assume number of observations is 30.

a. Write the estimate regression with values for all coefficients. Compute the t-statistic for each of the estimated coefficients (look up the formula in your textbook page 95).

b. Determine which (if any) of the estimated coefficients are statistically different from zero at 0.05 level.

c. Explain the meaning of R-square from this regression.

Q3) The demand for good X is given by: 𝑄𝑥 𝑑 = 1,000 – 0.5 Px + 0.25 Py – 8Pz + 0.05 I Research shows that the prices of related goods are given by Py = $300 and Pz = $60, while the average income of individuals buying this product is I = $35,000.

a. Indicate whether goods Y and Z are substitutes or complements for good X.

b. Is X an inferior or a normal good?

c. How many units of good X will be purchased when Px = $250?

d. Determine the demand function and inverse demand function for good X. Graph the demand curve for good X. (Hint – Inverse demand function is when Price is on the left hand side and Quantity is on the right hand side and the values of all other variables are plugged in.)