Simple Linear Regression (Ch 11)

Problem #1 A study was made on the amount of converted sugar in a certain process at various tempreatures. The data coded and recored as follows:

Temperature, x	Converted sugar, y
1.0	29.5
1.1	26.3
1.2	32.2
1.3	36.5
1.4	27.2
1.5	27.7
1.6	28.3
1.7	30.3
1.8	9.3
1.9	9.2
2.0	10.5

(a) Estimate the linear regression line.

(b) Estimate the mean amount of converted sugar produced when the coded temperature is 1.75.

(c) Plot the residuals vs temperature.

(d) Evaluate s^2

(e) Construct a 95% confidence interval for β_0

(f) Construct a 95% confidence interval for β_1

(g) Use an analysis-of-variance approach to test the hypothesis that $\beta_1 = 0$ against the alternative hypothesis $\beta_1 \neq 0$ at the 0.05 level of significance.

Problem # 2 (a) Compute and interpret the correlation coefficient for the following grades of 6 students selected at random:

Mathematics grade	70	92	80	74	65	83
English grade	74	84	63	87	78	90

(b) Test the hypothesis that ρ=0 in part (a) against the alternative that ρ≠0. Use a 0.05 level of significance.

Problem # 3 The following data were obtained in a study of the relationship between the weight and chest size of infants at birth.

Weight (kg)	Chest Size (cm)
2.75	29.5
2.15	26.3
4.41	32.2
5.52	36.5
3.21	27.2
4.32	27.7
2.31	28.3
4.3	30.3
3.71	28.7

(a) Calculate r.

(b) Test the null hypothesis that $\rho=0$ against the alternative that $\rho>0$ at the 0.01 level of significance.

(c) What percentage of the variation in infant chest sizes is explained by difference in weight?

Problem # 4 The pressure *P* of a gas corresponding to various volumes *V* is recorded, and the data are given below:

V (cm^3)	*P* (kg/cm^2)
50	64.7
60	51.3
70	40.5
80	25.6
90	23.8
100	7.8

The ideal gas law is given by the functional form $PV^{\gamma} = C$ where γ and C are constant. Estimate the constants γ and C.