MTH 325, Quiz #3, Spring 2023 Name _____KEY_____

Instructions: Answer each question as thoroughly as possible. Round answers to 4 decimal places as needed. Exact answers are best when possible. Be sure to answer all parts of each question.

1. Consider the data below where x_1 is furnace temperature and x_2 is die close time, and y is temperature difference on the die cast.

x_1	1250	1300	1350	1250	1300
x_2	6	7	6	7	6
y	80	95	101	85	92

x_1	1250	1300	1350	1350
x_2	8	8	7	8
y	87	96	106	108

a. Enter the data in R and find the correlation between pairs of three variables.

	x1	*x2*	*y*
x1	1		
x2	0	1	
y	0.957039	0.27344	1

b. Create a multiple regression model of y using the two independent variables. Describe your model test and test of each coefficient.

$$\hat{y} = 0.21x_1 + 3x_2 - 199.56$$

The full model:

$$H_0: \beta_i = 0 \ \forall i$$
$$H_a: \beta_i \neq 0, for\ some\ i$$

F	*Significance F*
319.3140496	8.06355E-07

We reject the null. At least one coefficient is not zero.

$$H_0: \beta_1 = 0$$
$$H_a: \beta_1 \neq 0$$

AND

$$H_0: \beta_2 = 0$$
$$H_a: \beta_2 \neq 0$$

24.2987603	3.19353E-07
6.942502943	0.000442849
T test stat	p-value

We can reject the null for both coefficients. Neither is 0.

c. Write the equation of your final, best-fit model.

d. $\hat{y} = 0.21x_1 + 3x_2 - 199.56$

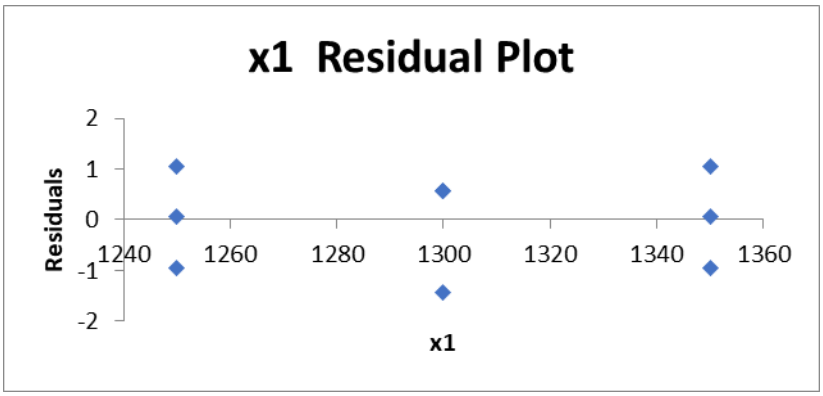
e. What proportion of the variability in y can be explained by the model?

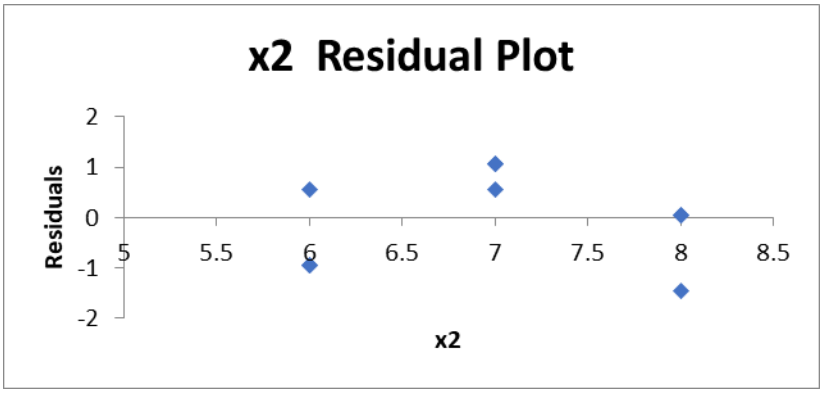
0.990692308

f. Create a 95% confidence interval for β_2.

(1.942638467, 4.057361533)

g. Create residual plots against both independent variables to test model assumptions.





It's harder when the datasets are so small, but these appear to be random and constant variance.

h. Predict y when x_1 is 1300 and x_2 is 7. Construct a 95% prediction interval around your mean prediction.

Mean of predictions: 94.44444

Interval:

92.0036 96.88529

Answers may vary slightly depending on the quality of the approximation

Include all graphs and model output to support your answers.