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STAT3008 Assignment 2

Question 3

a) After executed the R code, it returns

a)

	[,1]
Intercept	11.6819338
X1	0.3231552
X2	2.1526718

$\therefore \widehat{\boldsymbol{\beta}} = (11.6819, 0.32316, 2.1527)'$

b) $\widehat{\boldsymbol{Y}} = (19.10941, 33.96438, 24.06107, 19.10941, 11.35878, 29.01272, 33.64122, 21.58524, 14.15776)'$

$\hat{\boldsymbol{e}} = (1.890585, -8.964377, -3.061069, 4.890585, -2.358779, 6.987277, 2.358779, 2.414758, -4.157761)'$

$SYY = 716.8889$

$RSS = 200.2901$

$SSreg = 516.5988$

$\hat{\sigma}^2 = 33.38168$

$$\hat{V}ar(\widehat{\boldsymbol{\beta}}) = \begin{pmatrix} 13.052548 & 4.898245 & -6.710312 \\ 4.898245 & 21.461673 & -21.489987 \\ -6.710312 & -21.489987 & 21.914690 \end{pmatrix}$$

$R^2 = 0.7206121$

b) The best point estimator is $\tilde{\boldsymbol{y}}^* = \boldsymbol{x}^* \widehat{\boldsymbol{\beta}}$, where $\boldsymbol{x}^* = (1, -1, 1)'$

After executed the R code, it returns

$\tilde{y}^* = 13.51145$
$PI = [-12.10217, 39.12507]$

c) # statistic already available in the above and the question from model 2

$$H_0: E(\boldsymbol{Y}|\boldsymbol{X}) = \beta_0 + \beta_2 x_2 \quad vs \quad H_1: E(\boldsymbol{Y}|\boldsymbol{X}) = \beta_0 + \beta_1 x_1 + \beta_2 x_2$$

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Regression	1	0.1599	0.1599	0.0048	0.947
Residual	6	200.2901	33.3817		
Total	7	200.45			

Since the p-value > 0.05, we do not reject H_0 at $\alpha = 0.05$

We do not have sufficient evidence that $E(\boldsymbol{Y}|\boldsymbol{X}) = \beta_0 + \beta_1 x_1 + \beta_2 x_2$ is the appropriate model while comparing to $E(\boldsymbol{Y}|\boldsymbol{X}) = \beta_0 + \beta_2 x_2$
