姓名: SOLUTION 葉均承 應數三科學計算

學號: _____ **Quiz 1** 考試日期: 2021/03/02

1. 請框出答案. 2. 禁止作弊!

1. Find the least squares polynomials of degrees 1 and 2 for the data in the following table. Compute the error E in each case. (Need not to simplify)

x_i	1.0	1.1	1.3	1.5	1.9	2.1
y_i	1.84	1.96	2.21	2.45	2.94	3.18

Answer:

仿照方程式 (8.3)

$$\sum_{k=0}^{n} a_k \sum_{i=1}^{m} x_i^{j+k} = \sum_{i=1}^{m} y_i x_i^j \text{ for } j = 0, 1, ...n \Rightarrow A\vec{x} = \vec{b}$$

$$P_n(x) = a_n x^n + a_{n-1}x^{n-1} + ... + a_1 x + a_0$$

$$\text{Error} = E = \sum_{i=1}^{m} (y_i - P_n(x_i))^2$$

degree 1:

$$A = \begin{bmatrix} 6 & 8.8 \\ 8.8 & 14.7 \end{bmatrix}, \vec{b} = \begin{bmatrix} 14.58 \\ 22.808 \end{bmatrix} \Rightarrow \vec{x} = A^{-1}\vec{b} = \begin{bmatrix} 1.21962 \\ 062038 \end{bmatrix}$$

$$P_1(x) = 0.6208 + 1.21x, E = 2.719 \times 10^{-5}$$

degree 2: 一樣做法