
1. Type your answers in a **Microsoft Word** file and **name** the file in the following format:

Assignment2_SID_LastName_FirstName.

2. **Annotate** all your answers in your submission using the following **format**: #

Answer to Question X

3. Type **your name** and **student ID** on top of the **answer sheet**.

4. Submit your work in **Canvas** before the **deadline**.

5. Write down all your steps.

Question 1

Consider the following matrix.

3 marks

$$A = \begin{bmatrix} 2 & 0 & 1 \\ 1 & -2 & 1 \\ -1 & -2 & 0 \end{bmatrix}$$

- Find the characteristic polynomial of A .
- Find the eigenvalues of A

Write down all the steps in your calculations.

Answer:

The characteristic polynomial is $-\lambda^3 + \lambda$.

The eigenvalues are 0, 1, -1.

Question 2

3 marks

Fit the power model $y = \alpha_2 x^{\beta_2}$ to the data in the table below. Evaluate your model when the input is $x = 5$.

x_i	y_i
1	2.0537
2	3.0118
3	3.2382
4	4.0862
5	4.5040
6	4.7682
7	5.2481

Answer

$\log x_i$	$\log y_i$
0	0.3125
0.3010	0.4788
0.4771	0.5103
0.6020	0.6113
0.6989	0.6535
0.7781	0.6783
0.8450	0.7200

$$a_0 = 0.3155$$

$$a_1 = 0.4742$$

$$\alpha_2 = 2.0680$$

$$\beta_2 = 0.4742$$

$$y = \alpha x^\beta = 2.0680(5)^{0.4742} = 4.4368$$

Question 3 (3 marks)**4 marks**

Fit the linear model $a_0 + a_1x + a_2x^2$ to the data in the table below.

Evaluate your model for $x = 3$.

x_i	y_i
1	4.0714
2	8.9795
3	15.9875
4	25.1489
5	36.1409
6	49.1417
7	64.0671

$$\begin{bmatrix} 7 & 28 & 140 \\ 28 & 140 & 784 \\ 140 & 784 & 4676 \end{bmatrix} \begin{bmatrix} a_0 \\ a_1 \\ a_2 \end{bmatrix} = \begin{bmatrix} 203.537 \\ 1094.6129 \\ 6398.1709 \end{bmatrix}$$

$$\begin{bmatrix} 7 & 28 & 140 \\ 28 & 140 & 784 \\ 140 & 784 & 4676 \end{bmatrix}$$

$$\begin{bmatrix} 203.537 \\ 1094.6129 \\ 6398.1709 \end{bmatrix}$$

$$\begin{bmatrix} a_0 \\ a_1 \\ a_2 \end{bmatrix} = \begin{bmatrix} 0.9691 \\ 2.0441 \\ 0.9966 \end{bmatrix}$$

For $x = 3$, we have $y = 16.0704$