CSU33081 Assignment 2

Instructions

- There are 10 Multiple Choice Questions in this assignment.
- Answer **ALL** questions by entering A, B, C, D or E on the **Answer Sheet** provided.
- Upload to Blackboard the filled out Answer Sheet with your **type written solutions as a .docx file**.
- **Submissions without fully worked solutions will receive zero marks.**

Q1.

Consider the following MATLAB program:

X=(1~=0)|(2>2)&(7<4)

What is the value of X?

A. 1
B. False
C. True
D. 0
E. None of these

Q2.

What is approximately the value of r after the following Matlab code is executed?

p=[1 8 2];

r=roots(p);

A. [8 2]

B. [-4 -4]

C. [-0.258 -7.742]

D. $\begin{bmatrix} -0.258 \\ -7.742 \end{bmatrix}$

E. None of these

Q3.

What is the value of e when the following code is executed?

a=12/1*15/1; b=a/a*a; c=tand(30)+1/3; d=1+c; e=a-b*c+d

A. 0
B. 1020
C. 2010
D. 2020
E. None of these

Q4.

Apply the Power method to the following matrix and so determine approximately the largest in magnitude eigenvalue and the associated eigenvector.

$$A = \begin{bmatrix} -7 & 13 & -16 \\ 13 & -10 & 13 \\ -16 & 13 & -7 \end{bmatrix}$$

You may use $(1.0 \ -0.8 \ 0.9)^T$ as your initial guess for the eigenvector. You should perform 7 iterations. To a best approximation what is the largest in magnitude eigenvalue and the associated eigenvector? Choose your answer from the following:

A. -32, $(1.6 \ 0.8 \ 0.9)^T$
B. 34, $(1.0 \ -0.8 \ -1.0)^T$
C. -36, $(1.0 \ -1.0 \ 1.0)^T$
D. 32, $(1.2 \ -0.6 \ 0.1)^T$
E. None of these

Q5.

Consider the following discrete data:

T_k	0	1	2	3	4	5	6	7
S_k	1.15	2.32	3.32	4.53	5.65	6.97	8.02	9.23

We expect that there is a linear relationship between T and S. That is:

$$S = aT + b; \quad a, b \in \mathbb{R}$$

Find the parameters a and b that give the line of best fit in a least squares sense. a and b are to a nearest approximation:

A. 2.85379, 1.01676
B. 1.54632, 1.55387
C. 1.15630, 1.10167
D. 2.83019, 1.13452
E. None of these

Q6.

Given the experimental data:

(1, 5.12), (3, 3), (6, 2.48), (9, 2.34), (15, 2.18)

Find the parameters $\alpha, \beta \in \mathbb{R}$ that best fit the following function to the data in a least squares sense:

$$f(x) = \alpha e^{\beta x}$$

A. 1.3980, -0.050601
B. 1.3980, 0.050601
C. -1.3980, 0.050601
D. -1.3980, -0.050601
E. None of these

Q7.

For the data in Q6. above, what are the values of α, β to a best approximation if we fit the following hyperbolic function, in a least square sense, to the data?

$$g(x) = \alpha + \frac{\beta}{x}$$

A. 1.9681, 3.1468
B. 3.1468, 1.9681
C. 3.1468, -1.9681
D. -3.1468, -1.9681
E. None of these

Q8.

For the function $f(x) = \log_4(\cos(x))$ and the points $x_0 = 0.5$, $x_1 = 1.0$ and $x_2 = 1.5$ evaluate the Newtonian Divided Difference form of the quadratic interpolating polynomial $P_2(x)$ at the point $x = 1.3$

Choose your answer from the following:

A. 0.38163
B. 1.87312
C. 0.01875
D. -1.19004
E. None of these

Q9.

For the function $f(x) = x^3 \log_2(x)$ and the points $x_0 = 2$, $x_1 = 3$ and $x_2 = 7$ evaluate, to a best approximation, the quadratic interpolating polynomial at the point $x = 5$.

A. 26.67
B. 42.76
C. 76.17
D. 55.81
E. None of these

Q10. The upward velocity of a body is given as a function of time as:

$t\ (s)$	9	15	20	22
$v\ (ms^{-1})$	21	32	48	11

To find the acceleration at $t = 18s$, a scientist finds a second order interpolating polynomial approximation for the velocity, and then differentiates it to find the acceleration. The estimate of the acceleration in ms^{-2} at $t = 18s$ is, to a best approximation:

A. 4.060
B. 4.200
C. 8.157
D. 8.498
E. None of these