Assignment 01

Third Year BS (Honors) 2019-2020

Course Title: Math Lab III (MATLAB), Course Code: AMTH 350

Department of Applied Mathematics, University of Dhaka

Name: Roll No: Group: Solve all the following problems in MATLAB.

1. Enter the following matrix A and create

$$\mathbf{A} = \begin{bmatrix} & & 1 \cdots 8 \\ \vdots & \ddots & \vdots \\ 33 & \cdots & 40 \end{bmatrix}$$

   (a) A 4×5 matrix B from the 1^{st}, 3^{rd} and 5^{th} rows and 1^{st}, 2^{nd}, 4^{th} and 8^{th} columns of the matrix A.

   (b) 16-elements row vector C from the elements of the 5^{th} row and the 4^{th} and 6^{th} columns of the matrix A.

2. Define $\mathbf{a}$ $\mathbf{b}$ $\mathbf{c}$ as scalar $\mathbf{a} = 0.75$ and $\mathbf{b} = 11.3$ and $\mathbf{x}$, $\mathbf{y}$, $\mathbf{z}$ as the vectors $\mathbf{x} = [2,5,1,9,]$, $\mathbf{y} = [0.2, 1.1, 1.8, 2]$ and $\mathbf{z} = [-3, 2, 5, 4]$, then evaluate $(\mathbf{x}+\mathbf{y})\underline{\mathbf{z}}_3) + \mathbf{x}^{(\mathbf{y}}\underline{\mathbf{z}}+\mathbf{z}_2)$

$$\mathbf{x}_1 = \begin{pmatrix} \mathbf{x}_{1.1} & \mathbf{z}^{-2} & \mathbf{x}^{\mathbf{y}} \\ \mathbf{x}^5 & & \end{pmatrix}$$

3. Solve the following system of equations

$$2\mathbf{x}_1 + \mathbf{x}_2 + \mathbf{x}_3 - \mathbf{x}_4 = 12$$
$$\mathbf{x}_1 + 5\mathbf{x}_2 - 5\mathbf{x}_3 + 6\mathbf{x}_4 = 35$$
$$-7\mathbf{x}_1 + 3\mathbf{x}_2 - 7\mathbf{x}_3 - 5\mathbf{x}_4 = 7$$
$$\mathbf{x}_1 - 5\mathbf{x}_2 + 2\mathbf{x}_3 + 7\mathbf{x}_4 = 21$$

4. Plot $\sin^2 \mathbf{x}$, $\cos^2 \mathbf{x}$ $\mathbf{x}$ $\mathbf{x}$ $\cos 2\mathbf{x}$ on the same plot as well as subplots for $0 \leq \mathbf{x} \leq 2\mathbf{x}$, in different styles.

5. Consider the function $\mathbf{z} = 0.56 \cos(\mathbf{x}\mathbf{x})$. Draw a surface plot showing variation of $\mathbf{z}$ with $\mathbf{x}$ and $\mathbf{y}$. Given $\mathbf{x} \in [0,10]$ $\mathbf{x}$ $\mathbf{y} \in [0,100]$

6. Write a function to find the gradient of $\mathbf{f}(\mathbf{x}, \mathbf{y}) = \mathbf{x}^2 + \mathbf{y}^2 - 2\mathbf{x}\mathbf{y} + 4$ at

(a) (1,1) and (b) $(1, -2)$. Use the function name from command prompt as well as from a script file. 7. Use symbolic toolbox to solve the following problems

(a) Solve $\diamond\diamond^7 - 8\diamond\diamond^5 + 7\diamond\diamond^4 + 5\diamond\diamond^3 - 8\diamond\diamond + 9 = 0$

(b) Solve the ODE: $\frac{\diamond\diamond^2\diamond\diamond}{\diamond\diamond\diamond\diamond^2} + 10\frac{\diamond\diamond\diamond\diamond}{\diamond\diamond\diamond\diamond} + 5\diamond\diamond = 11, \diamond\diamond(0) = 1\ \diamond\diamond'(0) = -1$

(c) If $\diamond\diamond(\diamond\diamond) = \diamond\diamond^5 - 8\diamond\diamond^4 + 5\diamond\diamond^3 - 7\diamond\diamond^2 + 11\diamond\diamond - 9$, then evaluate $\diamond\diamond'(\diamond\diamond)$ and $\diamond\diamond''(\diamond\diamond)$. 5

(d) $\int_0^{\diamond\diamond\diamond\diamond} \frac{}{0.8\diamond\diamond^2+0.5\diamond\diamond+2} = ?$

8. The population of X from the year 1930 to the year 2020 is given in the following table:

Year	1930	1940	1950	1960	1970	1980	1990	2000	2010	2020
Population in million	249	277	316	350	431	539	689	833	1014	1203

(a) Fit the data with a second-order polynomial. Make a plot of the points and the polynomial.

(b) Fit the data with linear and spline interpolations. Estimate the population in 1995 with linear and spline interpolations.