General Sir John Kotelawala Defence University
Faculty of Engineering
Department of Mathematics
Mathematical Software - MA 1232

Learning Outcomes Covered: –
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Intake 39 - Semester 2 | Tutorial 04 | 29.08.2022

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1. What will be the result of the following MATLAB commands? Use MATLAB to check your answer.
   I) If x = [5,-3,18,4] and y = [-9,13,7,4], find,
   (a) $z = y > x$
   (b) $z = x < y$
   (c) $z = 9 < y$

   II) If x = [-9, -6, 0, 2, 5] and y = [-10, -6 2, 4,6], find,
   (a) $z = (x < y)$
   (b) $z = (x > y)$
   (c) $z = (x = y)$
   (d) $z = (x > 2)$

2. Suppose that x = [-4, -1, 0, 2, 10] and y = [-5, -2, 2, 5, 9].Write MATLAB commands to find the indices of the elements in x that are greater than the corresponding elements in y.

3. Consider $y = lnx$ for $x > 10, y = x$ for $0 \leq x \leq 10$ and $y = e^x - 1$ for $x < 0$.Write a MATLAB program to request an input value x from the user and compute y accordingly.

4. Suppose you want to compute the square root of the input if there is only one input value and the square root of the average of input values if there is two inputs. Write a MATLAB function file to implement this problem.

5. Write a MATLAB program that accepts a numerical value x from 0 to 100 as input and computes and displays the corresponding letter grade given by the following table.

Range	Grade
x ≥ 90	A
$80 \leq x \leq 89$	B
$70 \leq x \leq 79$	C
$60 \leq x \leq 69$	D
x ≤ 59	E

   (a) Use only nested if statements in your computation (do not use elseif).
   (b) Use only elseif clauses in your computation.

6. The value of π can be estimated from,

$$\frac{\pi^3}{32} = \sum_{n=0}^{\infty} \frac{(1)^n}{(2n+1)^3}$$

   Write a program (using a loop) that determines π for a given n. Run the program with n = 10, n = 100, and n = 1000. Compare the result with (Use format long)

7. A Fibonacci sequence is a sequence of numbers beginning with 0 and 1, where the value of each subsequent element is the sum of the previous two elements,

$$a_{i+1} = a_i + a_{i-1} \quad i.e. 0, 1, 1, 2, 3, 5, 8, 13, ...$$

   Related sequences can be constructed with other beginning numbers. Write a MATLAB program in a script file that the first lines of the script should ask values of the first two elements and the length of the sequence from the user. These two elements can be any two integers, except they cannot both be zero. Run the program when length n=5 and n=8 using first and second elements as 0, 1 and 5, 8 respectively

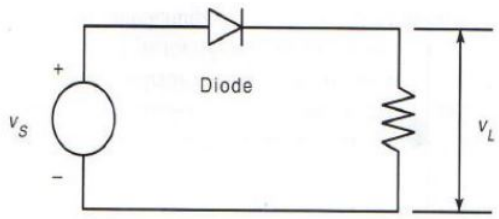
8. An ideal diode blocks the flow of current in the direction opposite that of the diode's arrow symbol. It can be used to make a half-wave rectifier shown in the following figure. For the ideal diode, the voltage V_L across the load R_L is given by,

$$V_L = \begin{cases} V_s & ; V_s > 0 \\ 0 & ; Vs \leq 0 \end{cases}$$

Suppose the supply voltage is,

$$V_s(t) = 3e^{-t/3}sin(\pi t)$$

Where time t is in seconds. Write a MATLAB program to plot the voltage V_L versus t for $0 \leq t \leq 10$.



9. The Taylor series expansion for sin(x) is,

$$sin(x) = x - \frac{x^3}{3!} + \frac{x^5}{5!} - \frac{x^7}{7!} + ... = \sum_{n=0}^{\infty} \frac{(1)^n}{(2n+1)!}x^{2n+1}$$

where x is in radians. Write a MATLAB program that determines sin(x) using the Taylor series expansion. The program asks the user to type a value for an angle in degrees.Then a program uses a loop for adding the terms of the Taylor series.If a_n is the n^{th} term in the series, then the sum S_n of the n terms is $S_n = S_{n-1} + a_n$. In each pass calculate the estimated error E given by,

$$E = |\frac{S_n - S_{n-1}}{S_{n-1}}|$$

Stop adding terms when $E \leq 0.000001$. The program displays the value of sin(x). Use the program for calculating,
(a) $sin(45°)$
(b) $sin(195°)$

10. Generate 10 points equally spaced along a sine curve in the interval [0,4*pi]. Use polyfit to fit a 7th-degree polynomial to the points.Evaluate the polynomial on a finer grid and plot the results.

11. Find the solution of the following system of equations, if possible.

$$6x + 4y = 1$$

$$3x + 2y = -1$$