

Experiment #01

Slot: L27+L28

MAT1011: CALCULUS FOR ENGINEERS

Class # 5972

Title: **Introduction to MATLAB**

1. Include the following in the lab record for Experiment #1:

- What is MATLAB?
- Using MATLAB as a calculator.
- Arrays in MATLAB (including matrix algebra).
- 2D and 3D plotting in MATLAB.
- Basic symbolic calculations and plotting using Symbolic toolbox.

2. Find a short MATLAB expression to build the matrix:

$$A = \begin{pmatrix} 1 & 3 & 5 & 7 & 9 & 11 & 13 & 15 \\ 2.5 & 2 & 1.5 & 1 & 0.5 & 0 & -0.5 & -1 \\ 0.25 & 0.5 & 1 & 2 & 4 & 8 & 16 & 32 \end{pmatrix}$$

Find a matrix B such that the product AB yields a square matrix made of the first, fourth, and seventh column of A .

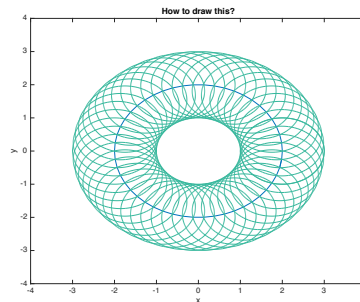
3. Write a MATLAB code to demonstrate that starting from any integer N the repeated application of the function:

$$f(x) = \begin{cases} x/2, & \text{if } x \text{ is even} \\ 3x + 1, & \text{if } x \text{ is odd} \end{cases}$$

yields a sequence which always ends at 1. For example $N = 7$ yields the sequence 22, 11, 34, 17, 52, 26, 13, 40, 20, 10, 5, 16, 8, 4, 2, 1 (*why do we stop at 1?*). Find the number of steps involved in reaching 1 if $N = abcd$ where $abcd$ is the last four digits of your register number.

4. Write a MATLAB code to find the sum $S(N)$ of first N Fibonacci numbers. Hence find $S(a + b + c + d)$ and $S(abcd)$ where $abcd$ is the last four digits of your register number. Optimize your code for a quick output.

5. Write a MATLAB code to draw the following figure:



6. Draw the surface given by the parametric form:

$$x = c + a \cos \theta \cos \phi; \quad y = c + a \cos \theta \sin \phi; \quad z = a \sin \theta$$

where $(\theta, \phi) \in [0, 2\pi]$ and c, a are arbitrary constants.

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- The lab record with the solutions to the exercise problems must be submitted in **pdf format only**.
 - Write virtuously and don't make it an oversized document (preferably < 8 pages with file size < 1 MB).
 - Copying others' work can be injurious to your grades.