Midtern Exam 14/12/2020 NAME_____

NUMBER_____

MAT116E MIDTERM EXAM (PART I)

The midterm exam consists of two sections. The first section is a open source paper exam (60 minutes). The following part is the first section of the exam. Each question is worth 25 points.

- You are required to use Matlab to solve the problems.
- Absolutely no interaction between students is allowed.
- Partial credit may be awarded ONLY if work is shown.

- Exams of students who are spotted with any electronic devices or social media platforms during the exam, will be invalid.
- Create a separate MATLAB script file for each problem.
- Submit all Matlab files (.m) to Ninova System.
- Each MATLAB file must have the following Header:

```
% Problem1: Midterm Exam, Your Name Here
```

Q1. Type this array into a MATLAB Script File to carry out the following instructions:

$$\mathbf{A} = \begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{bmatrix}$$

a) Use MATLAB to create a row vector **B** by extracting the elements from the second row of array **A**.

b) Use MATLAB to create a column vector **C** by extracting the elements from the third column of array **A** .

c) Use the cross-product function in MATLAB to create the vector **D**=**B** × **C**.

d) Use MATLAB to create the vector **E**=**B**+**C**

Q2.

Create a MATLAB Script File to plot an astroid on the xy plane over the parametric interval $-2\pi \leq t \leq 2\pi$, where

$$x = [\cos(t)]^3, \qquad y = [\sin(t)]^3$$

Also, plot the catacaustic of the astroid on the same plot over the same range for t:

$$x = \frac{\cos(t)\,[8 + 5\cos(2t) + 3\cos(6t)]}{13 + 3\cos(4t)}$$

$$y = \frac{4[\sin(t)]^3[7 + 6\cos(2t) + 3\cos(4t)]}{13 + 3\cos(4t)}$$

Make sure to use enough points to create smooth curves. Provide a plot title, labels for the axes, and a legend for the two curves.

Q3. Create a MATLAB Script File using a **FOR** loop to calculate the following function over the range $0 \leq t \leq 4\pi$:

$$z = \begin{cases} 0 & \text{for} \quad y \geq 0.5 \text{ or } y \leq -0.5 \\ y & \text{for} \quad -0.5 < y < 0.5 \end{cases}$$

where $y = \sin^3(t)$. Plot z versus t. Make sure to use enough points to create a smooth curve. Provide a plot title and labels for the axes. Do not use the graphics editor of matlab.