
MATH 152 MATLAB Computer Lab 5

Matrix Multiplication and Linear Transformations

Instructions

- Download `data5.mat` and upload to your MATLAB environment
- Save all variables to a file called `lab5.mat` and submit the file to Canvas
- Attend your scheduled lab section and visit MATLAB TA office hours for extra help

Exercise 1

The data file `data5.mat` contains matrices C and D and a vector \mathbf{w} .

- Compute $C^4\mathbf{w}$ and save the result as `Ex1Avec`.
- Compute $C^2D^T\mathbf{w}$ and save the result as `Ex1Bvec`.
- Compute $DC - CD$ and save the result as `Ex1Cmat`.

Exercise 2

The data file `data5.mat` contains the matrix

$$A = \begin{bmatrix} 2 & 0 & -1 & 1 \\ 4 & 1 & 0 & 3 \\ 0 & -1 & -4 & 2 \\ -6 & 0 & 7 & -8 \end{bmatrix}$$

Construct the matrix $E = E_4E_3E_2E_1$ where:

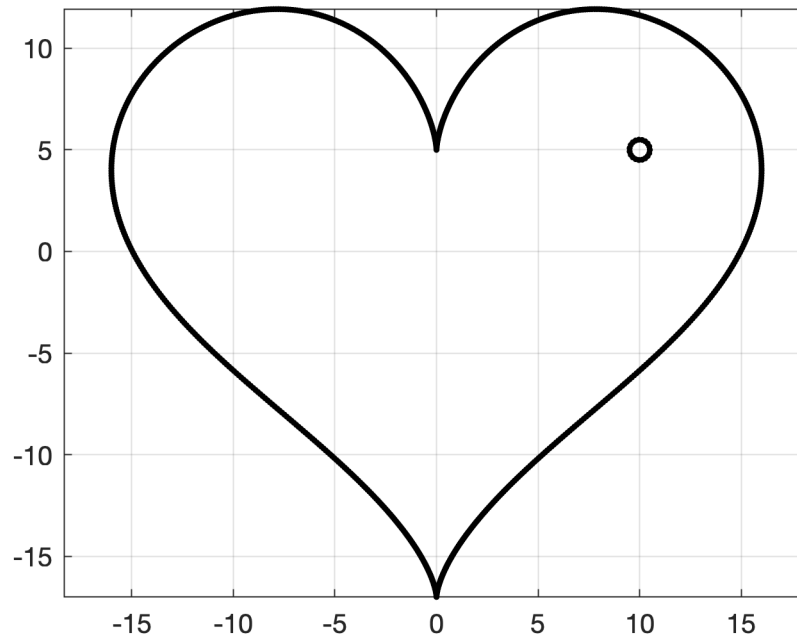
- E_1 is -2 times row 1 add to row 2
- E_2 is 3 times row 1 add to row 4
- E_3 is 1 times row 2 add to row 3
- E_4 is 2 times row 3 add to row 4

The result EA should be the row echelon form of A . Save E as `Ex2mat`.

Exercise 3

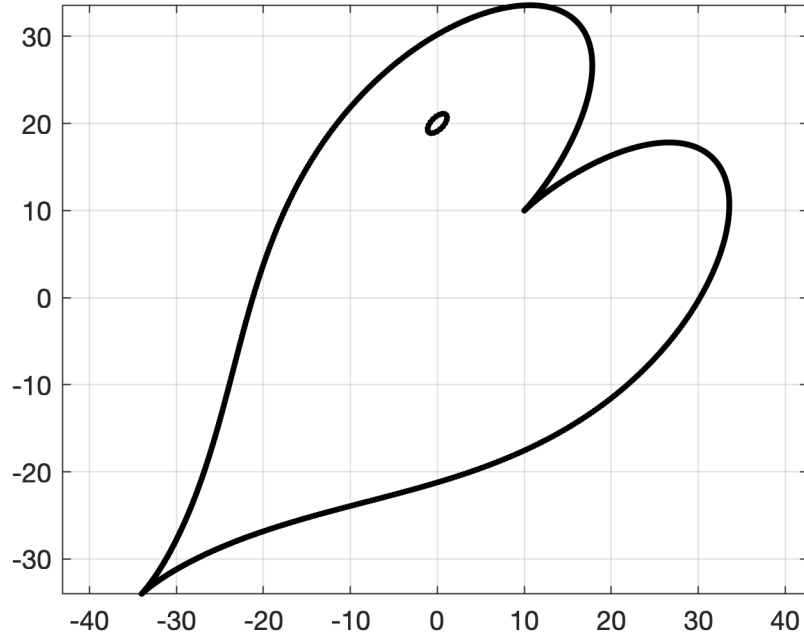
The data file `data5.mat` contains a matrix called `heart` with 2 rows and 1000 columns. Each column of `heart` is a point in the xy -plane. Plot the points using the command:

```
>> plot(heart(1,:),heart(2,:), 'k.'), axis equal, grid on
```



Note that the command `heart(1,:)` selects the x -values of all the points, and `heart(2,:)` selects the y -values.

- (a) Find the linear transformation which reflects through the line $y = -x$ and then rotates counterclockwise by $\pi/4$. Save the transformation matrix as `Ex3A.mat`.
- (b) Find the linear transformation which rotates counterclockwise by π , then shears in the x -direction by 2 then scales in the y -direction by 3. Save the transformation matrix as `Ex3B.mat`.
- (c) Find the linear transformation which corresponds to the image:



Save the transformation matrix as Ex3Cmat.