Finding roots of polynomials using MATLAB

Polynomials are entered as

a vector containing coefficients of polynomial

- Example: The polynomial $r^3 + 3r^2 - 4$ is entered as

  - >> p = [1 3 0 -4]

- >> r = roots(p)

  Gives roots of polynomial

Example: Find roots of $r^3 + 3r^2 - 4$

>> p = [1 3 0 -4]

r = roots(p)

r =

-2.0000 + 0.0000i

-2.0000 - 0.0000i

1.0000

Finding characteristic polynomial, eigenvalues and eigenvectors using MATLAB

First enter the $n \times n$ matrix A and then use the following sequence of commands

- **>> poly(A)**

Gives coefficients of <u>characteristic polynomial</u>

We can further use command **>> roots**. However we don't need it because of the

>> E= eig(A)

Gives <u>eigenvalues</u>

For each eigenvalue λ_i, solve $(A - \lambda_i I)\mathbf{v} = 0$ using

>> null($A - \lambda_i * eye(n)$,'r')

Gives <u>independent eigenvectors</u>
(in each column)

Direct Command: [P,V]=eig(A)

Gives <u>eigenvalues,</u>
Eigenvectors (in each column)
of matrix A

<p style="text-align:center"><u>Matlab Assignment # 4</u></p>

- Go through the hand out before attempting the assignment.
- Send the printout as email attachment or submit a hard copy.
- Deadline to submit the assignment is 25th May.

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1. Use MATLAB to find the characteristic polynomial, eigenvalues and eigenvectors of

$$A = \begin{bmatrix} 15 & -6 & -18 & -6 \\ -4 & 5 & 8 & 4 \\ 12 & -6 & -15 & -6 \\ 4 & -2 & -8 & -1 \end{bmatrix}$$

2. Use MATLAB to find the characteristic polynomial, eigenvalues and eigenvectors of

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

3. Problems 23, 25 and 26 in (6.1)