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 characteristic polynomial

We can further use command **>> roots**.

However we don't need it because of the

>> E= eig(A)

Gives eigenvalues

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

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

Gives independent eigenvectors (in each column)

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

Gives eigenvalues, Eigenvectors (in each column) of matrix A

Matlab Assignment # 4

- 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)