

# Laboratory Work 5

## Exercise 1:

1. Create the polynomial  $p(s) = 3 + 2s + s^2$  and display it.
2. Define a rational fraction  $q(s) = p(s)/(1 + 2s)$  and display its form.
3. Using `poly(0, 'x')`, create a polynomial variable  $x$ , then define  $f(x) = x^3 - 4x + 2$ .
4. Define a polynomial from its **roots**:  $[-2, 0, 2]$ .
5. Define another polynomial from its **coefficients**  $[2, -3, 1, 4]$  in ascending order of degree.
6. Compute the characteristic polynomial of  $A = \begin{pmatrix} 2 & 1 \\ -1 & 3 \end{pmatrix}$ .

## Exercise 2:

1. Define the polynomial  $P(x) = x^3 - 5x^2 + 2x + 8$  then, find its zeros.
2. Verify one of the zeros.
3. Define another polynomial  $R(x) = x^4 - 2x^3 - 7x^2 + 8x + 12$  and compute its zeros.

## Exercise 3:

1. Define:  $p1(s) = s^3 - 2s + 1$  and  $p2(s) = 2s^2 + s + 3$ .  
Perform the following operations:  
 $p1 + p2$ ,  $p1 - p2$ ,  $p1 \times p2$ ,  $p1/p2$ ,  $p1^3$ .
2. Perform the Euclidean division of  $p1$  by  $p2$ .
3. Compute the increasing powers division of  $p1$  by  $p2$ .

**Exercise 4:**

Let  $p(s) = s^4 - 3s^3 + 2s - 1$  and  $q(s) = s^3 - s^2 + s - 1$ . Perform the following:

1. Find the degree of **p**.
2. Compute its derivative.
3. Display its coefficients.
4. Get its variable name.
5. Factorize both **p** and **q**.
6. Compute:  
Least Common Multiple of **p** and **q**.  
Greatest Common Divisor of **p** and **q**.
7. Evaluate **p(s)** for  $s = 1.5$ .
8. Simplify the rational fraction  $r = P/q$ .