

Series N°2: Polynomials in MATLAB

Excercise N°1

Define the polynomial of the following equations :

$$\begin{aligned} f_1(x) &= 8x + 5 & f_3(x) &= 6x^2 - 150 \\ f_2(x) &= 2x^2 - 4x + 10 & f_4(x) &= 5x^5 + 6x^2 - 7x \end{aligned} \quad (1)$$

Excercise N°2

Apply the roots function to find the roots of the following equations :

$$\begin{aligned} f_1(x) &= 8x + 5 & f_3(x) &= 6x^2 - 150 \\ f_2(x) &= 2x^2 - 4x + 10 & f_4(x) &= 5x^5 + 6x^2 - 7x \end{aligned} \quad (2)$$

Excercise N°3

Apply the *polyval* function to evaluate the polynomial for $x = 0, 1, 2$, and -3 of the following equations :

$$\begin{aligned} f_1(x) &= x^6 - 3x^5 - 4x^2 + 3x + 2 & f_3(x) &= x^4 - 10x^3 + 35x^2 - 50x + 24 \\ f_2(x) &= x^5 - 7x^4 + 16x^2 + 25x + 52 & f_4(x) &= x^5 - 3x^4 + 5x^2 + 7x + 9 \end{aligned} \quad (3)$$

Excercise N°4

Let $f_1(x)$ and $f_2(x)$ be two polynomials :

$$\begin{aligned} f_1(x) &= 3x^6 + 15x^5 - 10x^3 - 3x^2 + 15x - 40 & f_2(x) &= 3x^2 - 2x - 6 \\ f_1(x) &= 2x^6 - 8x^4 + 4x^2 + 10x + 12 & f_2(x) &= x^4 + 2x^3 - 7x^2 - 8x + 12 \\ f_1(x) &= 3x^3 + 2x^2 - x + 4 & f_2(x) &= 8x^5 + 2x^3 - 3x^2 + 4x - 2 \\ f_1(x) &= x^2 - 7x + 10 & f_2(x) &= 4x^5 - 2x^3 + x + 2 \\ f_1(x) &= 3x^4 - 7x^3 + 2x^2 + x + 1 & f_2(x) &= x^2 - 6x - 12 \end{aligned} \quad (4)$$

1. Find the roots of each polynomial
2. Determine the polynomial $S(x)$ sum of two polynomials
3. Determine the polynomial $L(x)$ difference between two polynomials
4. Determine $P(x)$ the product (or convolution) of the two polynomials
5. Give the division of the polynomial $P(x)$ over the polynomial $f_1(x)$



6. Give the division of the polynomial $P(x)$ over the polynomial $f_2(x)$

Excercise N°5

1. Apply the *conv* function to calculate the polynomial $R_i(x) = P_i(x) \times Q_i(x)$ in each of the following situations
2. Apply the *deconv* function to calculate the division of $R_i(x)$ by $P_i(x)$
3. Apply the *deconv* function to calculate the division of $R_i(x)$ by $Q_i(x)$
4. Calculate the polynomial $T_i(x) = P_i(x) + Q_i(x)$ in each of the following situations
5. Calculate the polynomial $L_i(x) = P_i(x) - Q_i(x)$ in each of the following situations

$$\begin{aligned}
 a. \quad P_1(x) &= x^3 - 3x^2 + 3x - 5 & \text{and} \quad Q_1(x) &= x^3 - 2x^2 + 3x - 2 \\
 b. \quad P_2(x) &= x^4 + x^3 - 3x^2 + 3x - 5 & \text{and} \quad Q_2(x) &= x^3 - 4x^2 + 2x - 6 \\
 c. \quad P_3(x) &= x^3 + 3x^2 + 3x - 5 & \text{and} \quad Q_3(x) &= x^3 + 3x - 3
 \end{aligned} \tag{5}$$

Excercise N°6

Apply the *polyder* function to evaluate the derivative of the following equations :

$$\begin{aligned}
 f_1(x) &= 3x^6 + 15x^5 - 10x^3 - 3x^2 + 15x - 40 & f_2(x) &= 3x^2 - 2x - 6 \\
 f_1(x) &= 2x^6 - 8x^4 + 4x^2 + 10x + 12 & f_2(x) &= x^4 + 2x^3 - 7x^2 - 8x + 12 \\
 f_1(x) &= 3x^3 + 2x^2 - x + 4 & f_2(x) &= 8x^5 + 2x^3 - 3x^2 + 4x - 2 \\
 f_1(x) &= x^2 - 7x + 10 & f_2(x) &= 4x^5 - 2x^3 + x + 2 \\
 f_1(x) &= 3x^4 - 7x^3 + 2x^2 + x + 1 & f_2(x) &= x^2 - 6x - 12
 \end{aligned} \tag{6}$$

Excercise N°7

Apply the *polyint* function to evaluate the integration of the following equations :

$$\begin{aligned}
 f_1(x) &= 3x^6 + 15x^5 - 10x^3 - 3x^2 + 15x - 40 & f_2(x) &= 3x^2 - 2x - 6 \\
 f_1(x) &= 2x^6 - 8x^4 + 4x^2 + 10x + 12 & f_2(x) &= x^4 + 2x^3 - 7x^2 - 8x + 12 \\
 f_1(x) &= 3x^3 + 2x^2 - x + 4 & f_2(x) &= 8x^5 + 2x^3 - 3x^2 + 4x - 2 \\
 f_1(x) &= x^2 - 7x + 10 & f_2(x) &= 4x^5 - 2x^3 + x + 2 \\
 f_1(x) &= 3x^4 - 7x^3 + 2x^2 + x + 1 & f_2(x) &= x^2 - 6x - 12
 \end{aligned} \tag{7}$$