# Series N°1: Vectors in MATLAB

## Excercise N°1

Define each vector of the following equations in three different ways :

$$\begin{aligned} V_1(x) &= \{8 \quad 1 \quad 7 \quad 0\} & V_4(x) &= \{4 \quad -2 \quad 14 \quad 9\} \\ V_2(x) &= \{11 \quad 2 \quad 0 \quad 1 \quad 7\} & V_5(x) &= \{13 \quad 4 \quad -3 \quad 3 \quad -6\} \\ V_3(x) &= \{8 \quad 5 \quad 9 \quad -1 \quad 7 \quad 14\} & V_6(x) &= \{-3 \quad 10 \quad 7 \quad 2 \quad 5 \quad 11\} \end{aligned} \tag{1}$$

## Excercise N°2

Apply the $linspace(x_i, x_f, N)$ function to define each vector of the following equations :

$$\begin{aligned} V_1(x) &= \{0 \quad 2 \quad 4 \quad 6\} & V_4(x) &= \{-1 \quad -2 \quad -3 \quad -4\} \\ V_2(x) &= \{1 \quad 2 \quad 3 \quad 4 \quad 5\} & V_5(x) &= \{-2 \quad 0 \quad 2 \quad 4 \quad 6\} \\ V_3(x) &= \{3 \quad 6 \quad 9 \quad 12 \quad 15 \quad 18\} & V_6(x) &= \{-3 \quad -2 \quad -1 \quad 0 \quad 1 \quad 2\} \end{aligned} \tag{2}$$

## Excercise N°3

Apply the $x_i : p : x_f$ function to define each vector of the following equations :

$$\begin{aligned} V_1(x) &= \{0 \quad 2 \quad 4 \quad 6\} & V_4(x) &= \{-1 \quad -2 \quad -3 \quad -4\} \\ V_2(x) &= \{1 \quad 2 \quad 3 \quad 4 \quad 5\} & V_5(x) &= \{-2 \quad 0 \quad 2 \quad 4 \quad 6\} \\ V_3(x) &= \{3 \quad 6 \quad 9 \quad 12 \quad 15 \quad 18\} & V_6(x) &= \{-3 \quad -2 \quad -1 \quad 0 \quad 1 \quad 2\} \end{aligned} \tag{3}$$

## Excercise N°4

Let $G_1(x)$ and $G_2(x)$ be two vectors :

$$\begin{aligned} G_1 &= \{3 \quad 15 \quad -10 \quad -3 \quad 15 \quad -40\} & G_2 &= \{3 \quad -2 \quad -6\} \\ G_1 &= \{2 \quad -8 \quad 4 \quad 10 \quad 12\} & G_2 &= \{1 \quad 2 \quad -7 \quad -8 \quad 12\} \\ G_1 &= \{3 \quad 2 \quad -1 \quad 4\} & G_2 &= \{8 \quad 2 \quad -3 \quad 4 \quad -2\} \\ G_1 &= \{1 \quad -7 \quad 10\} & G_2 &= \{4 \quad -1 \quad 1 \quad 2\} \\ G_1 &= \{3 \quad -7 \quad 2 \quad 1 \quad 1\} & G_2 &= \{1 \quad -6 \quad -12\} \end{aligned} \tag{4}$$

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

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

## Excercise N°6

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

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

## Excercise N°7

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

| | | |
|---|---|---|
| $f_1(x) = 3x^6 + 15x^5 - 10x^3 - 3x^2 + 15x - 40$ | $f_2(x) = 3x^2 - 2x - 6$ | |
| $f_1(x) = 2x^6 - 8x^4 + 4x^2 + 10x + 12$ | $f_2(x) = x^4 + 2x^3 - 7x^2 - 8x + 12$ | |
| $f_1(x) = 3x^3 + 2x^2 - x + 4$ | $f_2(x) = 8x^5 + 2x^3 - 3x^2 + 4x - 2$ | (7) |
| $f_1(x) = x^2 - 7x + 10$ | $f_2(x) = 4x^5 - 2x^3 + x + 2$ | |
| $f_1(x) = 3x^4 - 7x^3 + 2x^2 + x + 1$ | $f_2(x) = x^2 - 6x - 12$ | |