Aim

To solve the polynomials and matrices using SCILAB

Exercises

1. Find the roots of the polynomial

$$p_2(x) = x^5 - 7x^4 + 16x^2 + 25x + 52$$

   Create a polynomial `p1` having coefficients `1, -7, 0, 16, 25, 52` in console window of SCILAB and use the built-in function `roots`.

   ```
   -->p1=[1 -7 0 16 25 52]
    P1  =

       1.  - 7.    0.    16.    25.    52.

   -->roots(p3)
    ans  =

       6.5013816
       2.74281
     - 1.5710506
     - 0.3365705 + 1.320176i
     - 0.3365705 - 1.320176i
   ```

2. Find the roots of the polynomial

$$p_2(x) = x^4 - 10x^3 + 35x^2 - 50x + 24$$

   Create a polynomial `p1` having coefficients `1 -10 35 -50 24`, in console window of SCILAB and use the built-in function `roots`.

   ```
   -->p5=[1 -10 35 -50 24]
    p5  =
       1.  - 10.    35.  - 50.    24.

   -->roots(p5)
    ans  =

       4.
       3.
       2.
       1.
   ```

3. Solve the quadratic equation
$$x^2 - 2x - 4 = 0$$

```
-->p6=[1 -2 -4]
 p6  =

    1.  - 2.  - 4.

-->roots(p6)
 ans  =

    3.236068
  - 1.236068
```

You can also verify the above answer using the following commands in console window

```
-->p=poly([3.236068, - 1.236068 ],'x')
 p  =

                   2
  - 4.0000001 - 2x + x
```

4. Addition and Subtraction of matrices

Compute *A+B* and *A–B* given that

$$A = \begin{bmatrix} 1 & 2 & 3 \\ 0 & 1 & 4 \end{bmatrix} \text{ and } B = \begin{bmatrix} 2 & 3 & 0 \\ -1 & 2 & 5 \end{bmatrix}$$

Solution

```
-->A=[1 2 3; 0 1 4]
 A  =

    1.    2.    3.
    0.    1.    4.

-->B = [2 3 0; -1 2 5]
 B  =

    2.    3.    0.
  - 1.    2.    5.

-->A + B
 ans  =

    3.    5.    3.
  - 1.    3.    9.

-->A-B
 ans  =

  - 1.  - 1.    3.
    1.  - 1.  - 1.
```

5. Determine the transpose of a matrix

$$A = \begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \end{bmatrix}$$

Solution

```
-->B=[1 2 3; 4 5 6]
 B   =

     1.    2.    3.
     4.    5.    6.

-->B'
 ans  =

     1.    4.
     2.    5.
     3.    6.
```

6. Determinant of a matrix

Given that

$$A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix} \text{ and } B = \begin{bmatrix} 2 & -1 \\ 2 & 0 \end{bmatrix}$$

compute $detA$ and $detB$.

```
->A=[1 2; 3 4]
 A   =

     1.    2.
     3.    4.

-->det(A)
 ans  =

   - 2.

-->B=[2 -1; 2 0]
 B   =

     2.   - 1.
     2.     0.

-->det(B)
 ans  =

     2.
```

7. Determinant of matrix

   Compute determinant of matrix A $A = \begin{bmatrix} 1 & 2 & -3 \\ 2 & -4 & 2 \\ -1 & 2 & -6 \end{bmatrix}$

```
-->A=[1 2 -3; 2 -4 2; -1 2 -6]
 A  =

     1.     2.   - 3.
     2.   - 4.     2.
   - 1.     2.   - 6.

-->det(A)
 ans  =

     40.
```

8. Use Cramer's rule to find the solution of the given matrix and verify the same with SCILAB.

$$2v_1 - 5 - v_2 + 3v_3 = 0$$
$$-2v_3 - 3v_2 - 4v_1 = 8$$
$$v_2 + 3v_1 - 4 - v_3 = 0$$

```
-->B=[2 -1 3; -4 -3 -2; 3 1 -1]
 B  =

     2.   - 1.     3.
   - 4.   - 3.   - 2.
     3.     1.   - 1.

-->delta=det(B)
 delta  =

     35.
-->D1=[5 -1 3; 8 -3 -2; 4 1 -1]
 D1  =

     5.   - 1.     3.
     8.   - 3.   - 2.
     4.     1.   - 1.

-->det(D1)
 ans  =

     85.

-->det(D1)/delta
 ans  =

     2.4285714

-->vl=det(D1)/delta
```

```
   vl  =

      2.4285714

-->D2=[2 5 3; -4 8 -2; 3 4 -1]
 D2  =

      2.     5.     3.
   - 4.     8.   - 2.
      3.     4.   - 1.

-->det(D2)
 ans  =

   - 170.

-->v2=det(D2)/delta
 v2  =

   - 4.8571429

-->D3=[2 -1 5; -4 -3 8; 3 1 4]
 D3  =
      2.   - 1.     5.
   - 4.   - 3.     8.
      3.     1.     4.

-->det(D3)
 ans  =

   - 55.

-->v3=det(D3)/delta
 v3  =

   - 1.5714286
```

Now we have the solutions `vl = 2.4285714`, `v2 = - 4.8571429` and `v3 = - 1.5714286`

9. Given the system of equations

$$\begin{cases} 2x_1 + 3x_2 + x_3 = 9 \\ x_1 + 2x_2 + 3x_3 = 6 \\ 3x_1 + x_2 + 2x_3 = 8 \end{cases}$$

Compute the unknown's x_1, x_2, and x_3 using the inverse matrix method.

```
     -->A=[2 3 1; 1 2 3; 3 1 2]
       A  =

            2.     3.     1.
            1.     2.     3.
            3.     1.     2.
```

```
-->B=[9 6 8]'
 B  =

    9.
    6.
    8.

-->x=(A\B)
 x  =

    1.9444444
    1.6111111
    0.2777778
```

Result

   Thus we learned the tool SCILAB for solving simple polynomials and
matrices.