Matlab Homework week 2

庄震丰 22920182204393

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1 Martix Multiplication

1.1 Description

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

solve the matrix $C = A \times B$

1.2 Analysis

Use the operator $*$ in Matlab directly.....

1.3 Codes and Result

```
A=[1,2,3;-2,0,0;1,0,1;-1,2,-3];
B=[-1,3;-2,2;2,1];
A*B;
```

Result:

$$ans = \begin{bmatrix} 1 & 10 \\ 2 & -6 \\ 1 & 4 \\ -9 & -2 \end{bmatrix}$$

2 Solving linear equations

2.1 Description

$$\begin{cases} 2x_1 - x_2 + 3x_3 = 5 \\ 3x_1 + x_2 - 5x_3 = 5 \\ 4x_1 - x_2 + x_3 = 9 \end{cases} \tag{1}$$

Solve the unknown variables x_1, x_2, x_3

2.2 Anaylsis

Use coefficient matrix A , vector **b** repersents the numbers on the right side of equal sign,

$$A \cdot \mathbf{x} = \mathbf{b}$$
$$\mathbf{x} = A^{-1} \cdot \mathbf{b}$$

and the function ***inv*** in Matlab maybe useful for the solution to inverse matrix.

2.3 Code and Result

```
A=[2,-1,3;3,1,-5;4,-1,1];
b=[5;5;9];
x=inv(A)*b
```

Result:

$$\mathbf{x} = \begin{bmatrix} 2 \\ -1 \\ 0 \end{bmatrix}$$

3 Solving roots of the equation

3.1 Description

There is a expression

$$(x-4)(x+5)(x^2-6x+9)$$

Expand it into a polynomial form and find the root of its corresponding unary n-order equation

3.2 Anaylsis

Use vectors to repersent expressions

If

$$A(s) = a_n s^n + a_{n-1} s^{n-1} \dots a_1 s + a_0$$

let

$$P = \Big[a_n, a_{n-1}, a_{n-2}, \dots, a_1, a_0\Big]$$

in matlab language. We also find the function ***conv*** can make Multiplication between matrices in Matlab.

while the function ***roots*** can give the solution of the equation.

3.3 Code and Result

```
A=[1,-4];
B=[1,5];
C=[1,-6,9];
D=conv(conv(A,B),C)
x=roots(D)
```

Result:

$x_1 = -5, x_2 = x_3 = 3, x_4 = 4$

4 Polynomial operation

4.1 Description

There is a expression

$$3x^6 + 12x^5 + 4x^4 + 7x^3 + 8x + 1$$

Give the Result of that divided by $(x-3)(x^3+5x)$.

4.2 Anaylsis

Use vectors to repersent expressions(the same solution way in problem 3). We also find the function **[R,v]deconv(A,B)** can make Polynomial vector **A** divided by Polynomial vector **B**.

which means,$A = R \times B + v$.

4.3 Code and Result

```
A=[3 12 4 7 0 8 1];
B=conv([1,-3],[1,0,5,0]);
[R v]=deconv(A,B)
```

Result:

$$R = \left[3, 21, 52\right], v = \left[0, 0, 0, 103, 55, 788, 1\right]$$

$R = 3x^2 + 21x + 52$
$v = 103x^3 + 55x^2 + 788x + 1$