• Instructor: He Wang Email: he.wang@northeastern.edu

Further Reading on $2:

We can use Matlab to do some computation to verify our calculations. We list some basic MATLAB functions about linear system here.

Input matrices and vectors to MATLAB:

```
A=[1 -3 -5; 1 -1 -2; 3 -1 1];
B=[1 1 1; 2 3 2; 3 8 2];
b=[1; 0; 3];
c = [2 1 8];
```

Sum and scalar product

```
A+B
3A
```

transpose Transpose vector or matrix A^T

```
C= A.'
C = transpose(A)
```

mtimes Matrix multiplication AB

```
C = A*B
C = mtimes(A,B)
```

mpower Matrix power A^k

```
C = A^3
C = mpower(A,3)
```

inv Matrix inverse A^{-1}

```
B^(-1)
inv(B)
```

rank Rank of matrix A

```
rank(A)
```

trace Sum of diagonal elements

```
trace(A)
```

https://www.mathworks.com/help/matlab/linear-algebra.html

Further reading.

Example 1. Using Matlab to calculate A^5, A^{10}, A^{50} for

$$A = \begin{bmatrix} 0.1 & 0.2 & 0.4 & 0.3 \\ 0.6 & 0.2 & 0.1 & 0.1 \\ 0.7 & 0.1 & 0.1 & 0.1 \\ 0.1 & 0.3 & 0.1 & 0.5 \end{bmatrix}$$

Solution by Matlab:

```
A=
[0.1 0.2 0.4 0.3;
0.6 0.2 0.1 0.1;
0.7 0.1 0.1 0.1;
0.1 0.3 0.1 0.5]


A^5 =

    0.3117    0.2086    0.2034    0.2762
    0.3301    0.2066    0.1917    0.2716
    0.3340    0.2063    0.1889    0.2708
    0.3185    0.2086    0.1976    0.2753


A^10 =

    0.3220    0.2077    0.1964    0.2739
    0.3216    0.2078    0.1966    0.2740
    0.3216    0.2078    0.1967    0.2740
    0.3218    0.2077    0.1965    0.2739


A^50 =

    0.3218    0.2077    0.1965    0.2739
    0.3218    0.2077    0.1965    0.2739
    0.3218    0.2077    0.1965    0.2739
    0.3218    0.2077    0.1965    0.2739
```

What can you conclude from the results here? We will see the theory and real word application in dynamic system behind this example in §7.4.