CMPSC/Math 451, Numerical Computation

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Introduction to Matlab

MATLAB is an advanced program package tool for *numerical computation* and *visualization*.

Advantages:

- easy to use and program.
- can be run interactively or from a file.
- 2- and 3-dimensional plot.
- many built-in numerical functions.
- can be developed with "toolboxes" of different kinds.
- possibility to link in FORTRAN or C programs.
- Object-oriented programing.

Disadvantages:

- Relatively slow (compare to FORTRAN or C).

MATLAB: **Mat**rix **Lab**oratory

- Work directly with matrices and vectors
- Specially good in solving systems of linear equations, computing eigenvalues and eigenvectors, factorizing matrices, etc.
- Basic datatypes: Matrices of double precision number.

```
>> a = 2
a =
     2
>> A = [1, 3.5, 4.6; 2, 6.4, -1.28]
A =
    1.0000    3.5000    4.6000
    2.0000    6.4000   -1.2800
>> x = [2.6; pi; 1/3]
x =
    2.6000
    3.1416
    0.3333
>> whos
  Name        Size                Bytes  Class

  A           2x3                    48  double array
  a           1x1                     8  double array
  x           3x1                    24  double array

Grand total is 10 elements using 80 bytes
```

How to solve $Ax = b$. Example $\begin{pmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 0 \end{pmatrix} \begin{pmatrix} x_1 \\ x_2 \\ x_3 \end{pmatrix} = \begin{pmatrix} 1 \\ 2 \\ 3 \end{pmatrix}$

```
>> A = [1,2,3;4,5,6;7,8,0]
A =
     1     2     3
     4     5     6
     7     8     0
>> b = [1;2;3]
b =
     1
     2
     3
>> x = A\b
x =
   -0.3333
    0.6667
         0
```