Class_Work_4

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General

```
clear all, clc, format compact
```

Expand Matrices and substitute elements

```
clc
a=-5, b=7, m=4,n=5
A=round(rand(m,n)*(b-a)+a)
A(3,1:2:end)=[1 ,0 ,pi] % end- last index
d1=A([3 3 3 ],:) %extract the third row 3 times
d2=A(ones(1,3)*3,:) %the same as d1
A(1:2,4:5)=[3 6; 8 6]
A(7:8,7)=[3;4] % Expanding matrice A
```

```
a =
    -5
b =
     7
m =
     4
n =
     5
A =
     5     3     6     6     0
     6    -4     7     1     6
    -3    -2    -3     5     5
     6     2     7    -3     7
A =
    5.0000    3.0000    6.0000    6.0000         0
    6.0000   -4.0000    7.0000    1.0000    6.0000
    1.0000   -2.0000         0    5.0000    3.1416
    6.0000    2.0000    7.0000   -3.0000    7.0000
d1 =
    1.0000   -2.0000         0    5.0000    3.1416
    1.0000   -2.0000         0    5.0000    3.1416
    1.0000   -2.0000         0    5.0000    3.1416
d2 =
    1.0000   -2.0000         0    5.0000    3.1416
```

```
    1.0000   -2.0000         0    5.0000    3.1416
    1.0000   -2.0000         0    5.0000    3.1416
A =
    5.0000    3.0000    6.0000    3.0000    6.0000
    6.0000   -4.0000    7.0000    8.0000    6.0000
    1.0000   -2.0000         0    5.0000    3.1416
    6.0000    2.0000    7.0000   -3.0000    7.0000
A =
    5.0000    3.0000    6.0000    3.0000    6.0000         0         0
    6.0000   -4.0000    7.0000    8.0000    6.0000         0         0
    1.0000   -2.0000         0    5.0000    3.1416         0         0
    6.0000    2.0000    7.0000   -3.0000    7.0000         0         0
         0         0         0         0         0         0         0
         0         0         0         0         0         0         0
         0         0         0         0         0         0    3.0000
         0         0         0         0         0         0    4.0000
```

Complex_Numbers

```
clc
e1=3+4*j %  is defined by i or j
e3=angle(e1)
e2=complex(3,4) %is defined by a function
```

```
e1 =
   3.0000 + 4.0000i
e3 =
    0.9273
e2 =
   3.0000 + 4.0000i
```

assignment_4, 1

```
clc,clear
a=10, b=15
r=(b-a)*rand(20,1)+a
a=-1, b=1
im=(b-a)*rand(20,1)+a
z=r+im*i
z=complex(r,im)
% z(:,2)=abs(z)
% z(:,3)=angle(z(:,1))
z=[z,abs(z),angle(z)]
```

```
a =
    10
b =
    15
r =
   13.2787
   10.1786
   14.2456
   14.6700
   13.3937
   13.7887
   13.7157
   11.9611
   13.2774
   10.8559
   13.5302
   10.1592
   11.3846
   10.2309
   10.4857
   14.1173
   13.4741
   11.5855
```

```
   14.7511
   10.1722
a =
    -1
b =
     1
im =
   -0.1225
   -0.2369
    0.5310
    0.5904
   -0.6263
   -0.0205
   -0.1088
    0.2926
    0.4187
    0.5094
   -0.4479
    0.3594
    0.3102
   -0.6748
   -0.7620
   -0.0033
    0.9195
   -0.3192
    0.1705
   -0.5524
z =
  13.2787 - 0.1225i
  10.1786 - 0.2369i
  14.2456 + 0.5310i
  14.6700 + 0.5904i
  13.3937 - 0.6263i
  13.7887 - 0.0205i
  13.7157 - 0.1088i
  11.9611 + 0.2926i
  13.2774 + 0.4187i
  10.8559 + 0.5094i
  13.5302 - 0.4479i
  10.1592 + 0.3594i
  11.3846 + 0.3102i
  10.2309 - 0.6748i
  10.4857 - 0.7620i
  14.1173 - 0.0033i
  13.4741 + 0.9195i
  11.5855 - 0.3192i
  14.7511 + 0.1705i
  10.1722 - 0.5524i
z =
  13.2787 - 0.1225i
...
```

Arithmetic Operation with Matrices

Scalar and Matrice

```
clc
g1=reshape(1:6,3,2)'
g2=g1*2 %the scalar value is multiplied by every element in the matrix
g3=g1/2
g4=sin(g1)
```

```
g1 =
     1     2     3
     4     5     6
g2 =
     2     4     6
     8    10    12
g3 =
    0.5000    1.0000    1.5000
```

```
    2.0000    2.5000    3.0000
g4 =
    0.8415    0.9093    0.1411
   -0.7568   -0.9589   -0.2794
```

Adding/Substracting Matrices

```
%Matrix arithmetic operations are defined by the rules of linear algebra.
%Notice that addition and subtraction of matrices works element by element (add a(1,1) to b
%then add a (1,2) to b(1,2), etc...)
%Also note that the number of rows and columns of each array must be the same.
clc
A=[ 2 1 5; 6 8 4]
B=[8 5 1; 0 9 2]
AB=A+B %  Matrix dimensions must agree
BA=A-B
C=A'*B %matrix multiplication involving inner products between rows and columns
```

```
A =
     2     1     5
     6     8     4
B =
     8     5     1
     0     9     2
AB =
    10     6     6
     6    17     6
BA =
    -6    -4     4
     6    -1     2
C =
    16    64    14
     8    77    17
    40    61    13
```

Dot(scalar) multiplication of vectors

C = dot(A,B) returns the scalar product of the vectors A and B

```
clc
u=2:2:10
v=2*u
uv=u*v'
uv=dot(u,v)
```

```
u =
     2     4     6     8    10
v =
     4     8    12    16    20
uv =
   440
uv =
   440
```

Cross multiplication of vectors

C = cross(A,B) returns the cross product of the vectors A and B. That is, C = A x B.
A and B must be 3-element vectors.

```
clc
a=1:3
b=[2 5 7.5]
```

```
c=cross(a,b)
```

```
a =
     1     2     3
b =
    2.0000    5.0000    7.5000
c =
         0   -1.5000    1.0000
```

Linear equations

```
clc
A=[1 2 3;4 5 6; 7 8 0];
b=[366;804;351]
x=A\b
x=A^(-1)*b
x=inv(A)*b
```

```
b =
   366
   804
   351
x =
   25.0000
   22.0000
   99.0000
x =
   25.0000
   22.0000
   99.0000
x =
   25.0000
   22.0000
   99.0000
```

Element by element operations on arrays

A.*B denotes element-by-element multiplication. A andB must have the same dimensions. The period character (.) distinguishes the array operations from the matrix operations.

```
clc
A=[1 2; -4 0]
B=[1 2 ; -3 3]
c1=A.*B
c2=A+B
c3=A./B
c4=A.^2
c5=2.^A
```

```
A =
     1     2
    -4     0
B =
     1     2
    -3     3
c1 =
     1     4
    12     0
c2 =
     2     4
    -7     3
c3 =
```

```
    1.0000    1.0000
    1.3333         0
c4 =
     1     4
    16     0
c5 =
    2.0000    4.0000
    0.0625    1.0000
```

assignment_4, 2

```
A=(reshape (1:9,3,3)')^2
B=(reshape (1:9,3,3)').^2
```

```
A =
    30    36    42
    66    81    96
   102   126   150
B =
     1     4     9
    16    25    36
    49    64    81
```

assignment_4, 3

```
x=2:2:10, y=3:3:15
 z=(x.*y+y./x)./((x+y).^(y-x))+12.^(x./y)
```

```
x =
     2     4     6     8    10
y =
     3     6     9    12    15
z =
    6.7415    5.4965    5.2579    5.2421    5.2415
```

assignment_4, 4

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```
x=linspace(23,67,25) %a
y=sin(x)' %b
A=rand(2,3) %c
B=rand(2) %d
D=rand(2) %e
G=B+D %f
K=A'*B %g
K1=B*A %g-not the same!!
L=G+55; %h
M=[A, B;fliplr(x(1:5));y((end-4):end)'] %i
M1=[A, B;fliplr(x(5:-1:1));y((end-4):end)'] %i the same as M
q8=x(1:2:25);%j
q12=y([3 6 21 9 17]);%k
```

```
x =
  Columns 1 through 9
   23.0000   24.8333   26.6667   28.5000   30.3333   32.1667   34.0000   35.8333   37.6667
  Columns 10 through 18
   39.5000   41.3333   43.1667   45.0000   46.8333   48.6667   50.5000   52.3333   54.1667
  Columns 19 through 25
   56.0000   57.8333   59.6667   61.5000   63.3333   65.1667   67.0000
y =
   -0.8462
```

```
    -0.2950
     0.9993
    -0.2238
    -0.8832
     0.6822
     0.5291
    -0.9568
    -0.0324
     0.9736
    -0.4729
    -0.7282
     0.8509
     0.2865
    -0.9996
     0.2324
     0.8790
    -0.6886
    -0.5216
     0.9593
     0.0236
    -0.9716
     0.4807
     0.7221
    -0.8555
A =
    0.7513    0.5060    0.8909
    0.2551    0.6991    0.9593
B =
    0.5472    0.1493
    0.1386    0.2575
D =
    0.8407    0.8143
    0.2543    0.2435
G =
    1.3879    0.9636
    0.3929    0.5010
K =
    0.4465    0.1778
    0.3738    0.2556
    0.6205    0.3800
K1 =
    0.4492    0.3812    0.6307
    0.1698    0.2502    0.3705
M =
    0.7513    0.5060    0.8909    0.5472    0.1493
    0.2551    0.6991    0.9593    0.1386    0.2575
   30.3333   28.5000   26.6667   24.8333   23.0000
    0.0236   -0.9716    0.4807    0.7221   -0.8555
M1 =
    0.7513    0.5060    0.8909    0.5472    0.1493
    0.2551    0.6991    0.9593    0.1386    0.2575
   23.0000   24.8333   26.6667   28.5000   30.3333
    0.0236   -0.9716    0.4807    0.7221   -0.8555
```

assignment_4, 5

```
w=linspace(0,2*pi)
z=2*sin(w).*w+2*w.^2
```

```
w =
  Columns 1 through 9
         0    0.0635    0.1269    0.1904    0.2539    0.3173    0.3808    0.4443    0.5077
  Columns 10 through 18
    0.5712    0.6347    0.6981    0.7616    0.8251    0.8885    0.9520    1.0155    1.0789
  Columns 19 through 27
    1.1424    1.2059    1.2693    1.3328    1.3963    1.4597    1.5232    1.5867    1.6501
  Columns 28 through 36
    1.7136    1.7771    1.8405    1.9040    1.9675    2.0309    2.0944    2.1579    2.2213
  Columns 37 through 45
    2.2848    2.3483    2.4117    2.4752    2.5387    2.6021    2.6656    2.7291    2.7925
```

```
  Columns 46 through 54
    2.8560    2.9195    2.9829    3.0464    3.1099    3.1733    3.2368    3.3003    3.3637
  Columns 55 through 63
    3.4272    3.4907    3.5541    3.6176    3.6811    3.7445    3.8080    3.8715    3.9349
  Columns 64 through 72
    3.9984    4.0619    4.1253    4.1888    4.2523    4.3157    4.3792    4.4427    4.5061
  Columns 73 through 81
    4.5696    4.6331    4.6965    4.7600    4.8235    4.8869    4.9504    5.0139    5.0773
  Columns 82 through 90
    5.1408    5.2043    5.2677    5.3312    5.3947    5.4581    5.5216    5.5851    5.6485
  Columns 91 through 99
    5.7120    5.7755    5.8389    5.9024    5.9659    6.0293    6.0928    6.1563    6.2197
  Column 100
    6.2832

z =

  Columns 1 through 9
         0    0.0161    0.0644    0.1446    0.2564    0.3994    0.5731    0.7766    1.0093
  Columns 10 through 18
    1.2702    1.5582    1.8723    2.2112    2.5736    2.9582    3.3635    3.7881    4.2302
  Columns 19 through 27
    4.6885    5.1611    5.6466    6.1431    6.6492    7.1631    7.6832    8.2079    8.7357
  Columns 28 through 36
    9.2651    9.7947   10.3231   10.8490   11.3712   11.8887   12.4006   12.9059   13.4039
  Columns 37 through 45
   13.8940   14.3758   14.8490   15.3133   15.7687   16.2154   16.6537   17.0839   17.5066
  Columns 46 through 54
   17.9226   18.3329   18.7383   19.1402   19.5398   19.9386   20.3383   20.7405   21.1472
  Columns 55 through 63
   21.5602   21.9816   22.4137   22.8586   23.3186   23.7962   24.2937   24.8136   25.3585
  Columns 64 through 72
   25.9307   26.5328   27.1674   27.8367   28.5434   29.2897   30.0779   30.9104   31.7891
  Columns 73 through 81
   32.7161   33.6934   34.7228   35.8058   36.9440   38.1387   39.3910   40.7020   42.0724
  Columns 82 through 90
   43.5030   44.9939   46.5455   48.1578   49.8305   51.5632   53.3552   55.2056   57.1135
  Columns 91 through 99
   59.0773   61.0957   63.1669   65.2889   67.4597   69.6769   71.9379   74.2402   76.5808
  Column 100
   78.9568
```

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