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Exercise 1

```
t=[-2:0.4:2]';
x=(t+1).*sin(t.^2).*cos(t.^2).^3;
disp('x='),disp(x)
y=2*sin(t-1)./(t.^2.*log(t.^3+1)+1);
disp('y='),disp(y)
z=exp(t.*sin(t))./(t.^2+1);
disp('z='),disp(z)
```

```
x=
   -0.2114
    0.1923
   -0.0004
    0.0616
    0.0920
         0
    0.2146
    0.5547
    0.0048
   -0.8333
    0.6341

y=
  -0.0105 + 0.0151i
  -0.0503 + 0.1039i
  -0.0423 + 0.3524i
  -3.6013 + 0.0000i
  -1.9920 + 0.0000i
  -1.6829 + 0.0000i
  -1.1182 + 0.0000i
  -0.3142 + 0.0000i
   0.1625 + 0.0000i
   0.2185 + 0.0000i
   0.1719 + 0.0000i

z=
    1.2326
```

```
    1.3904
    1.2541
    1.0824
    1.0074
    1.0000
    1.0074
    1.0824
    1.2541
    1.3904
    1.2326
```

Exercise 2

```
clear all
x=[0:0.2:4]';
y=x.^2-0.2*x+1;
fprintf('y=\n');disp(y)
```

```
y=
    1.0000
    1.0000
    1.0800
    1.2400
    1.4800
    1.8000
    2.2000
    2.6800
    3.2400
    3.8800
    4.6000
    5.4000
    6.2800
    7.2400
    8.2800
    9.4000
   10.6000
   11.8800
   13.2400
   14.6800
   16.2000
```

Exercise 3

```
clear all
r=[3.001 3.002 2.999 2.998 3.008 3.005 3.000];
h=[4.498 4.499 4.500 4.502 4.505 4.495 4.506];
A=2*pi*r.^2+2*pi*r.*h;
disp('A = '); disp(A')
V=pi*r.^2.*h;
disp('V = '); disp(V')
```

```
A =
  141.3999
  141.4848
  141.3057
  141.2774
  141.9944
  141.6073
  141.4848

V =
  127.2628
  127.3759
  127.1497
  127.1214
  128.0561
  127.5171
  127.4041
```

Exercise 4

```
clear all
disp('Create a 4x4 random matrix A with integer elements')
A=randi([-10 10],4)
disp('(a) Get those elements of A that are located in rows 1 to 3 and
columns 2 to 4.')
B=A(1:3,2:4); disp(B)
disp('(b) Add a 5th row to A and set it equal to the first column of A.')
C=[A; A(:,1)'];
disp(C)
disp('(c) Replace the last 2X2 submatrix of A by a 2X2 identity matrix.')
D=A;
D(3:4,3:4)=eye(2);
disp(D)
disp('(d) Delete the first and third columns of A.')
E=A;
E(:,[1 3])=[];
disp(E)
```

```
Create a 4x4 random matrix A with integer elements

A =

     6    -8     2     7
    -2    -8    -9   -10
    -5     9    -6   -10
    -2    10    -3    -7

(a) Get those elements of A that are located in rows 1 to 3 and columns 2 to
4.
    -8     2     7
    -8    -9   -10
     9    -6   -10
```

```
(b) Add a 5th row to A and set it equal to the first column of A.
     6    -8     2     7
    -2    -8    -9   -10
    -5     9    -6   -10
    -2    10    -3    -7
     6    -2    -5    -2

(c) Replace the last 2X2 submatrix of A by a 2X2 identity matrix.
     6    -8     2     7
    -2    -8    -9   -10
    -5     9     1     0
    -2    10     0     1

(d) Delete the first and third columns of A.
    -8     7
    -8   -10
     9   -10
    10    -7
```

Exercise 5

```
clear all
u = [-2 -1 0 -3];
A=[-1 -2 0 5;3 2 1 -1;1 1 9 -5;1 -2 2 3];
B=[2 3 1 -1;-1 -2 2 1;1 3 9 -4;-1 4 2 3];
X1=B*inv(A)
X2=B.*inv(A)
X3=(B')^2*A
X4=(B').^2.*A
x=A\u'


X1 =

    0.8724    1.2347    0.2041   -1.0357
   -0.1020   -0.6122    0.1633    0.5714
    1.4847    0.9082    1.2245   -1.4643
    3.9898    1.9388    0.8163   -3.6429


X2 =

   -0.6224    0.3980   -0.1020   -0.3929
   -0.5612   -0.7347    0.2041   -0.6429
    0.1735    0.1224    1.1020    0.2857
   -0.3622    0.6939    0.0408   -0.5357


X3 =

     5    22    95   -67
```

```
    49    18    97   -35
   141    18   797  -247
   -52   -58  -408   224


X4 =

    -4    -2     0     5
    27     8     9   -16
     1     4   729   -20
     1    -2    32    27


x =

   -0.6888
    0.4388
   -0.1735
   -0.3622
```

Exercise 6

```
clear all
A=[1 -1 0 5;3 2 1 -1;1 1 9 -4;1 -7 2 3];
determinant=det(A);
disp(['Determinant= ',num2str(determinant)])
Ainv=inv(A);
disp('Inverse= '), disp(Ainv)
p=poly(A);
disp('Characteristic polynomial= '), disp(p)
lambda=eig(A);
disp('Eigenvalues= '), disp(lambda)
```

```
Determinant= -870
Inverse=
   -0.0345    0.3333   -0.0575    0.0920
    0.1207   -0.0000    0.0345   -0.1552
    0.0931   -0.0667    0.1218   -0.0149
    0.2310   -0.0667    0.0184   -0.0494

Characteristic polynomial=
    1.0000  -15.0000   63.0000   33.0000 -870.0000

Eigenvalues=
  -2.8991 + 0.0000i
   4.6534 + 3.6429i
   4.6534 - 3.6429i
   8.5924 + 0.0000i
```

Exercise 7

```
clear all
u=[-1 1 0];
v=[2 -1 3];
w=[2 8 3];
left_hand_term=cross(u,cross(v,w))
right_hand_term=dot(u,w)*v-dot(u,v)*w
disp('Equality iff the following logical (comparison) vector test has all
components 1')
Test=left_hand_term==right_hand_term
```

```
left_hand_term =

    18    18    27


right_hand_term =

    18    18    27

Equality iff the following logical (comparison) vector test has all
components 1

Test =

  1×3 logical array

   1   1   1
```

Exercise 8

```
clear all
u=[1 0 0];
v=[1 1 0];
w=[1 1 1];
Volume=abs(dot(u,cross(v,w)));
disp(['Volume=' num2str(Volume)])
```

```
Volume=1
```

Exercise 9

```
clear all
p=[1 -8.8 19.25 6.25 -39.75 8.55 13.5];
disp(['(a) p(2)=',num2str(polyval(p,1.5))])
disp(['(b) p([2,-2,0,1])= ',num2str(polyval(p,[1.5,-2,0,1.1]))])
Roots=roots(p);
Roots=Roots';
disp(['Roots = ',num2str(Roots)])
```

```
disp('poly reconstruction confirmation (notice the initial polynomial)')
Coefficients=poly(Roots);
disp(['Coefficients = ' num2str(Coefficients)])
```

```
(a) p(2)=-5.3291e-15
(b) p([2,-2,0,1])= -5.329071e-15           441          13.5     -1.090752
Roots = 5           3         1.5           1        -1.2        -0.5
poly reconstruction confirmation (notice the initial polynomial)
Coefficients = 1         -8.8        19.25         6.25       -39.75
8.55         13.5
```

Exercise 10

```
clear all
p=[1 -2 3 -4 5 -6 7 -8];
q=[1 2 -3 4 0 5];
Product=conv(p,q)
[quotient,remainder]=deconv(p,q)
```

```
Product =

     1     0    -4    12   -20    33   -46    59   -81    77   -62    35
-40


quotient =

     1    -4    14


remainder =

     0     0     0   -48    63   -67    27   -78
```

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