Matlab Tutorial

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Diary Output File

```
Exercise 1
help colon

Exercise 2
M = rand(6,6)
M =

    0.8147    0.2785    0.9572    0.7922    0.6787    0.7060
    0.9058    0.5469    0.4854    0.9595    0.7577    0.0318
    0.1270    0.9575    0.8003    0.6557    0.7431    0.2769
    0.9134    0.9649    0.1419    0.0357    0.3922    0.0462
    0.6324    0.1576    0.4218    0.8491    0.6555    0.0971
    0.0975    0.9706    0.9157    0.9340    0.1712    0.8235
M(1:2:end,1)

ans =

    0.8147
    0.1270
    0.6324

M(2:2:end,1)

ans =

    0.9058
    0.9134
    0.0975

M(1:2:end,:)

ans =

    0.8147    0.2785    0.9572    0.7922    0.6787    0.7060
    0.1270    0.9575    0.8003    0.6557    0.7431    0.2769
    0.6324    0.1576    0.4218    0.8491    0.6555    0.0971

M(1:2:end,1:2:end)

ans =

    0.8147    0.9572    0.6787
    0.1270    0.8003    0.7431
    0.6324    0.4218    0.6555

M(1:2:end,2:2:end)
ans =

    0.2785    0.7922    0.7060
    0.9575    0.6557    0.2769
    0.1576    0.8491    0.0971

Exercise 3
z = zeros(3,4)

z =

     0     0     0     0
     0     0     0     0
     0     0     0     0
```

```
help zeros
f = 7 * ones(5,6)

f =

     7     7     7     7     7     7
     7     7     7     7     7     7
     7     7     7     7     7     7
     7     7     7     7     7     7
     7     7     7     7     7     7

Exercise 4
help ones
r1 = randn(2,3)

r1 =

    0.6715    0.7172    0.4889
   -1.2075    1.6302    1.0347

Exercise 5
help rand

Exercise 6
help randn

clear i j
i = sqrt(-1);
pi

ans =

    3.1416

Exercise 7
help format
format long
pi

ans =

   3.141592653589793

pi = 3

pi =

     3

pi

pi =

     3

clear pi
pi

ans =

   3.141592653589793

x = 3;
y = 7;
z1 = x*y;
z2 = x / y;
z3 = x + y;
z4 = mod(7,3);
r = 3;
vol = 4/3*pi*r^3;
v1 = [10 11 12 13];
v2 = [45 23 12 10];
vsum = v1 + v2;
```

```
vsum2 = 5 + v2;
m = [ 1 2 3; 6 5 2; 7 5 3];
v3 = [20; 19; 18];
mv = m * v3;

vprod = v1 .* v2

vprod =

   450   253   144   130

j1 = 4;
e = 1/3;
j1sqrt = j1^e;
j1 = 1:5;
j1

j1 =

     1     2     3     4     5

j2 = j1 .^ 2

j2 =

     1     4     9    16    25

j3 = 1:5;
j4 = (3/2).^j

j4 =

  0.918919036439500 + 0.394446199714361i

x = 2;
y = sin(x);
xv = [2:0.1:3];
yv = sin(xv);
yv

yv =

  Columns 1 through 5

   0.909297426825682   0.863209366648874   0.808496403819590   0.745705212176720   0.675463180551151

  Columns 6 through 10

   0.598472144103956   0.515501371821464   0.427379880233830   0.334988150155905   0.239249329213982

  Column 11

   0.141120008059867

zv = exp(xv)

zv =

  Columns 1 through 5

   7.389056098930650   8.166169912567650   9.025013499434122   9.974182454814718  11.023176380641601

  Columns 6 through 10

  12.182493960703473  13.463738035001692  14.879731724872837  16.444646771097048  18.174145369443060

  Column 11

  20.085536923187668

lv = log(xv)

lv =
```

```
  Columns 1 through 5

   0.693147180559945   0.741937344729377   0.788457360364270   0.832909122935104   0.875468737353900

  Columns 6 through 10

   0.916290731874155   0.955511445027436   0.993251773010283   1.029619417181158   1.064710736992428

  Column 11

   1.098612288668110

Exercise 8
help ops

a = [1 2 3];
b = [0.5 0.5 0.5];
c = a ./ b

c =

     2     4     6
Exercise 9
m = [1 2 3; 6 5 2; 7 5 3];
help eig
m_eig = eig(m)

m_eig =
  10.710426283532639
  -2.408272990792371
   0.697846707259733

Exercise 10
help det
help inv

det(m)
ans =   -18

m_inv = inv(m)

m_inv =
  -0.277777777777778  -0.500000000000000   0.611111111111111
   0.222222222222222   1.000000000000000  -0.888888888888889
   0.277777777777778  -0.500000000000000   0.388888888888889

Exercise 11
b = [4;2;1];
x = m \ b
x =
  -1.500000000000000
   2.000000000000000
   0.500000000000000
help slash

Exercise 12
e = exp(1)

e =

   2.718281828459045

(-sqrt(16)-4)/(2*e^4+1)

ans =
  -0.072597718754510

Exercise 13
k = (1:20);
k = k.^2;
sum(k)
ans = 2870
help cumsum
help sum
```

```
Exercise 14
help plot
j = (1:51);
x = sin(2*pi*j/50);
y = cos(6*pi*j/50);
plot(x,y)
plot(j,x)
x = 0:0.1:pi;
plot(x,sin(x))
x1 = -2:.01:2;
y = x1.^2;
x2 = -3:.01:3;
z = x2.^3;
plot(x1,y,x2,z)
plot(x1,y,'r:',x2,z,'c--')

Exercise 15
help hold
clf;
plot(x1,y,'r:');
hold on;
plot(x2,z,'c--');

Exercise 16
help subplot
clf;
subplot(2,1,1);
plot(x1,y,'r:');
subplot(2,1,2);
plot(x2,z,'c--');
help figure

Exercise 17
help xlabel
xlabel('x')

Exercise 18
help ylabel
ylabel('y')

Exercise 19
help title
title('x y sin thingy')

Exercise 20
help stem
stem(c)

Exercise 21
help semilogy
semilogy(zv)

Exercise 22
help semilogx
semilogx(x)

Exercise 23
help loglog
loglog(x1,y)

Exercise 24
help text
text(1,2,"words")

Exercise 25
help print
print('plot.png','-dpng')
print('plot.png','-dpng')
print('plot.png','-dpng')

Exercise 26
help ezplot
ezplot('sin(x)')
```

```
ezplot('sin(x)')

Exercise 27
help help

Exercise 28
lookfor binomial
help which
doc

Exercise 29
edit myfile.m
myfile
Done!

Exercise 30
edit fact.m
fact(2)
ans = 2
fact(7)
ans = 5040
fact(4)
ans = 24
fact(5)
ans = 120
fact(10)
ans = 3628800

help if
fact(4)
f = 1
f = 2
f = 6
f = 24
ans = 24
fact(4)
ans = 24

Exercise 31
edit fact2.m
help for
fact2(4)
ans = 24
fact2(5)
ans = 120
fact(10)
ans = 3628800
fact2(10)
ans = 3628800

Exercise 32
(note the name is changed from the assignment because dec2bin is already defined in matlab)
edit dec2bin.m <-- this is a read only file
bina = dec2bin(37) <-- this is the function and it's result
bina = '100101'
help while
help for
help rem
help floor
edit decToBits.m
decToBits(37)
ans = 1     0     0     1     0     1

Exercise 33
help fprintf
help fopen
help fread
help fwrite
help fclose

Exercise 34
help save
help load
save vars
```

```
M = rand(20,20);
imagesc(M);
Fs = 4000;
Ts = 1/Fs;
t = 0:Ts:5;
y = sin(2*pi*400*t);
sound(y,Fs);
audiowrite('mysin400.wav',y,Fs);
clear y
y = audioread('mysin400.wav');
sound(y,Fs);
v = [1,0,-10,2];
rts = roots(v);
v1 = poly(rts);
v1
v1 = 1.000000000000000   0.000000000000002  -9.999999999999998   2.000000000000000
rts
rts =
  -3.257897013029435
   3.057087256556327
   0.200809756473106

quad('sin',0,5)
ans = 0.716337813168117

Exercise 35
help quad
syms k n;
s1 = symsum(k^2,k,0,n)
s1 = (n*(2*n + 1)*(n + 1))/6
s2 = expand(s1)
s2 = n^3/3 + n^2/2 + n/6
subs(s2,n,20)
ans = 2870

Exercise 36
help simplify
help factor
help expand
help collect
help numden
help subs
help solve
help fourier
help laplace
help ztrans
help diff
help int
syms t T n;
i1 = int(t*cos(2*pi*t),t,0,T)
i1 = -(2*sin(pi*T)^2 - 2*T*pi*sin(2*pi*T))/(4*pi^2)
i1 = simplify(i1)
i1 = -(sin(pi*T)^2 - T*pi*sin(2*pi*T))/(2*pi^2)

Exercise 37
syms e x;
e = (2*x^2 - 3*x + 1) / (x^3 + 2*x^2 - 8*x -18);
de = diff(e,x)
de = - (4*x - 3)/(- x^3 - 2*x^2 + 8*x + 18) - ((2*x^2 - 3*x + 1)*(3*x^2 + 4*x - 8))/(- x^3 - 2*x^2 + 8*x + 18)^2
de = simplify(de)
de = -(2*x^4 - 6*x^3 + 13*x^2 + 76*x - 62)/(- x^3 - 2*x^2 + 8*x + 18)^2

Exercise 38
syms d m;
m = sym([d^2 2 7; d d^3 9; 1 5 1/d])
m =
[d^2,   2,   7]
[  d, d^3,   9]
[  1,   5, 1/d]

det(m)

ans = d^4 - 7*d^3 - 45*d^2 + 35*d + 16
```

```
inv(m)
ans =
[   (d^2 - 45)/(d^4 - 7*d^3 - 45*d^2 + 35*d + 16), (35*d - 2)/(d*(d^4 - 7*d^3 - 45*d^2 + 35*d + 16)),   -(7*d^3 -
[            8/(d^4 - 7*d^3 - 45*d^2 + 35*d + 16),        (d - 7)/(d^4 - 7*d^3 - 45*d^2 + 35*d + 16), (- 9*d^2 + 7
[(- d^3 + 5*d)/(d^4 - 7*d^3 - 45*d^2 + 35*d + 16),   -(5*d^2 - 2)/(d^4 - 7*d^3 - 45*d^2 + 35*d + 16),  -(- d^5 + 2

 Exercise 39
a = [1 2 -9 -18];
b = [2 -3 1];
[r,p] = residue(b,a)
r =
   0.333333333333334
   4.666666666666665
  -3.000000000000000
p =
   3.000000000000001
  -3.000000000000000
  -2.000000000000000

Exercise 40
syms x;
f = (2*x^2 - 3*x + 1) / (x^3 + 2*x^2 - 9*x-18);
pdf = diff(int(f))
pdf = 1/(3*(x - 3)) - 3/(x + 2) + 14/(3*(x + 3))
simplify(pdf)
ans = 1/(3*(x - 3)) - 3/(x + 2) + 14/(3*(x + 3))

Exercise 41
f = (2*x^2-3*x-1) / (x^3+2*x^2-9.4*x-18);
pfe = diff(int(f))
pfe = (5*(- 2*x^2 + 3*x + 1))/(- 5*x^3 - 10*x^2 + 47*x + 90)

a = [1 2 -9.4 -18];
b = [2 3 1];
 [r,p] = residue(b,a)

r =

   1.429138221995239
   0.938287656347388
  -0.367425878342627


p =

  -3.175032623565354
   3.039945414333279
  -1.864912790767925

nameprompt = 'Enter your name, por favor:';
clear c;
c{1} = 'Name';
c{2} = 'Profession';
c
c = {'Name'}    {'Profession'}

clear d;
d.name = 'Bob';
d.title = 'Jefe';
d
d =
     name: 'Bob'
    title: 'Jefe'
diary off
```

37.) $\frac{d}{dx}\left[\frac{2x^2-3x+1}{x^3+2x^2-8x-18}\right] = \left(\frac{\frac{d}{dx}[2x^2-3x+1][x^3+2x^2-8x-18] - [2x^2-3x+1]\frac{d}{dx}[x^3+2x^2-8x-18]}{(x^3+2x^2-8x-18)^2}\right)$

$$= \frac{[4x-3][x^3+2x^2-8x-18] - [2x^2-3x+1][3x^2+4x-8]}{(x^3+2x^2-8x-18)^2}$$

$$= \frac{\left[4x^4+\underline{0x^3}-\underline{32x^2}-\underline{72x}-\underline{3x^3}-\underline{6x^2}+\underline{24x}+54\right]-\left[6x^4+8x^3-\underline{16x^2}-\underline{9x^3}-\underline{12x^2}-\underline{24x}+\underline{3x^2}+4x-8\right]}{\begin{matrix}-12\\+3\end{matrix}\qquad\begin{matrix}\\+4\end{matrix}}$$

$$4x^4+5x^3-38x^2-48x+54 \qquad 6x^4-x^3-25x^2-20x-8$$

$$\frac{\left[4x^4+5x^3-38x^2+48x+54\right]-\left[6x^4-x^3-25x^2-20x-8\right]}{(x^3+2x^2-8x-18)^2}$$

$$\frac{-2x^4+6x^3-13x^2-76x+62}{(-x^3-2x^2+8x+18)^2} = \frac{-2x^4+6x^3-13x^2-76x+62}{(-x^3-2x^2+8x+18)^2}$$