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## PART 1 Simple Introduction

(10 points) 1.  $y = e^{x+x^2}$  and  $y = \sin(x)\cos(x)$ ,  $x$  is from -5 to 5. Please plot the figure in a **1\*2** figure .(Hint: use *subplot*. Both numerical method and symbolic method is ok)

定义  $y = e^{x+x^2}$  和  $y = \sin(x)\cos(x)$ ,  $x$  的定义域为 [-5, 5], 并在在 **1\*2** 的图中画出两个函数。 (提示 : 使用 *subplot* 来画 **1\*2** 的图。数值法和符号法都可行)

```
subplot(1,2,1)

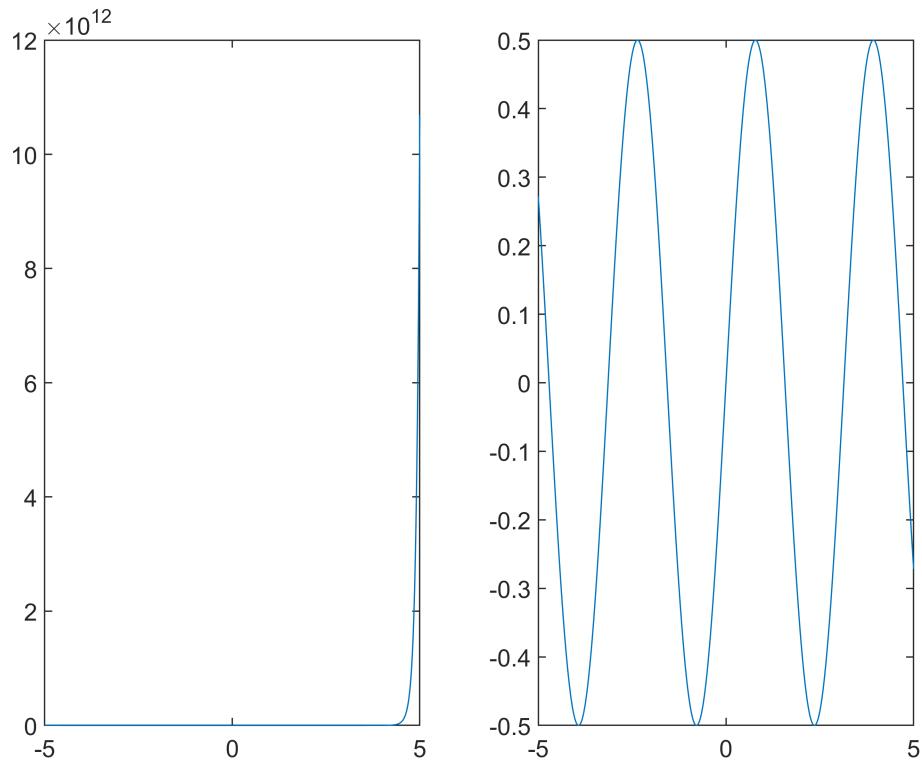
x = -5:0.00001:5;
y = exp(x + x.^2);

plot(x,y)

subplot(1,2,2)

x = -5:0.00001:5;
y = sin(x).*cos(x);

plot(x,y)
```



(8 points)2. Let  $a = 17.2$ ,  $b = 4$ . Please calculate the following formulas and **show** the results.

令  $a = 17.2$ ,  $b = 4$ 。请计算出  $c$  与  $d$  的值并展示出结果。

$$c = \sqrt[3]{a + 9.8}$$

$$d = 100 \cdot \sqrt{5b + 16}$$

```

a = 17.2;
b = 4;

c = (a + 9.8).^(1/3);
d = 100*(5*b + 6).^(1/2);

```

c

c = 3

d

d = 509.9020

(10 points)3. Please solve the following equations.

请求解以下方程组

$$\begin{cases} 3x + 2y - z = 10 \\ -x + 3y + 2z = 5 \\ x - y - z = -1 \end{cases}$$

a. changing to the matrix form.

用矩阵表示该方程组系数

b. using matrix operation to solve. (**Hint:**use A/B or A\B)

请使用矩阵方法求解该方程组

```
syms x y z;
f1 = [ 3*x + 2*y - z == 10
       -x + 3*y + 2*z == 5
       x - y - z == -1];
[a,b] = equationsToMatrix(f1,[x y z]);
matrix = a
```

```
matrix =
( 3   2   -1)
(-1  3    2)
( 1  -1  -1)
```

```
solution = a\b
```

```
solution =
(-2)
( 5 )
(-6)
```

(12 points) 4. Find the prime number between 1 and 100 by using loop and branching. (*primes* is not allowed)

找到 1 到 100 之间的质数并显示结果。 (函数 *primes* 不被允许使用)

```
primes = [];
for i = 2:99
    k = 1;
    for j = 2:(i - 1)
        if mod(i,j) == 0
            k = 0;
            break
    end
    if k == 1
        primes = [primes i];
    end
end
```

```

end

end

if k == 1

    primes = [primes,i];

end

end

disp(primes)

```

2      3      5      7      11     13     17     19     23     29     31     37     41     43     47     53     59     61     67

## PART 2 File Loading and Analysis

(24 points)5. Fetching external data( Do not change the value you obtain)

外部数据获取 (不要修改获取的数据的值)

a. Load file Array.mat, display vector and matrix

读入 Array.mat, 并显示其中的两个变量 vector 及 matrix

b. Assign the 3rd, 6th, 9th, and 12th digits to a vectorA and display vectorA

将 vector 中第 3、6、9、12 个数赋给 vectorA, 并显示结果

c. Assign vector to the vectorB, change the 4th number in the vectorB to 12, and display vectorB

将 vector 赋值给 vectorB, 将 vectorB 中的第 4 个数修改为 12 后显示结果

d. Assign rows 5, 6, and 7 of matrix to matrixA and display matrixA

将 matrix 的第 5, 6, 7 行赋予 matrixA, 并显示结果

e. Assign rows 1,2, and columns 2,3 of matrix to a matrixB and display matrixB

将 matrix 的第 1, 2 行及第 2, 3 列赋予 matrixB, 并显示结果

f. Find the location of a value less than 3 in the matrix

找出 matrix 中小于 3 的值的位置

```
% Load file Array.mat, display vector and matrix  
data = load("Array.mat");
```

```
disp(data.vector)
```

```
4 -4 3 -3 2 2 -1 0 -4 4 0 5
```

```
disp(data.matrix)
```

```
-1 2 -4 5 4  
-2 -3 4 -2 -3  
3 3 5 -4 -2  
-4 3 1 -1 -4  
3 -3 3 1 -5  
4 3 2 -5 5  
0 -5 4 5 -4  
-3 4 -2 2 -4  
1 -1 0 2 4  
0 2 -4 0 4
```

```
% Assign the 3rd, 6th, 9th, and 12th digits to a vectorA and display vectorA  
vectorA = [data.vector(3), data.vector(6), data.vector(9), data.vector(12)];
```

```
disp(vectorA)
```

```
3 2 -4 5
```

```
% Assign vector to the vectorB, change the 4th number in the vectorB to 12,  
% and display vectorB
```

```
vectorB = data.vector;  
vectorB(4) = 12;
```

```
disp(vectorB)
```

```
4 -4 3 12 2 2 -1 0 -4 4 0 5
```

```
% Assign rows 5, 6, and 7 of matrix to matrixA and display matrixA  
matrixA = data.matrix(5:7, :);
```

```
disp(matrixA)
```

```
3 -3 3 1 -5  
4 3 2 -5 5  
0 -5 4 5 -4
```

```
% Assign rows 1,2, and columns 2,3 of matrix to a matrixB and display matrixB  
matrixB = data.matrix(1:2, 2:3);
```

```
disp(matrixB)
```

```
2 -4  
-3 4
```

```
% Find the location of a value less than 3 in the matrix
```

```
[r,c] = size(data.matrix);  
k = 1;
```

```

for i = 1:r

    for j = 1:c

        if data.matrix(i,j) < 3

            location = [i,j];
            fprintf('location %i: (%i,%i)\n', k, location(1), location(2))
            k = k + 1;

        end

    end

end

```

```

location 1: (1,1)
location 2: (1,2)
location 3: (1,3)
location 4: (2,1)
location 5: (2,2)
location 6: (2,4)
location 7: (2,5)
location 8: (3,4)
location 9: (3,5)
location 10: (4,1)
location 11: (4,3)
location 12: (4,4)
location 13: (4,5)
location 14: (5,2)
location 15: (5,4)
location 16: (5,5)
location 17: (6,3)
location 18: (6,4)
location 19: (7,1)
location 20: (7,2)
location 21: (7,5)
location 22: (8,1)
location 23: (8,3)
location 24: (8,4)
location 25: (8,5)
location 26: (9,1)
location 27: (9,2)
location 28: (9,3)
location 29: (9,4)
location 30: (10,1)
location 31: (10,2)
location 32: (10,3)
location 33: (10,4)

```

(24 points)6. Load *data.xlsx* , fix the data table and display (Hint: *readtable/importdata* may be helpful)

读入 excel 数据, 补全数据表(计算第三列)并输出

output formal example :

	月份	销售额...	占总产值...
1	'1月'	100	NaN
2	'2月'	520	NaN
3	'3月'	800	NaN
4	'4月'	1500	NaN
5	'5月'	1320	NaN
6	'6月'	1100	NaN
7	'7月'	875	NaN
8	'8月'	987	NaN
9	'9月'	652	NaN

月份	销售额 (万元)	占总产值...
'1月'	'100'	'0.85295%'
'2月'	'520'	'4.4353%'
'3月'	'800'	'6.8236%'
'4月'	'1500'	'12.7943%'
'5月'	'1320'	'11.259%'
'6月'	'1100'	'9.3825%'
'7月'	'875'	'7.4633%'
'8月'	'987'	'8.4186%'
'9月'	'652'	'5.5612%'

```
table = readtable("data.xlsx","VariableNamingRule","preserve");

for i = 1:13

    table{i,3} = table{i,2}./11724;

end

disp(table)
```

月份	销售额 (万元)	占总产值百分比
{'1月'}	100	0.0085295
{'2月'}	520	0.044353
{'3月'}	800	0.068236
{'4月'}	1500	0.12794
{'5月'}	1320	0.11259
{'6月'}	1100	0.093825
{'7月'}	875	0.074633
{'8月'}	987	0.084186
{'9月'}	652	0.055612
{'10月'}	1300	0.11088
{'11月'}	1600	0.13647

{'12月' }  
{'销售总额：'}

970  
11724

0.082736  
1

(16 points)7.

a.load *picture.jpg* and display this picture

加载图片文件 (*picture.jpg*) 并显示

```
Image = imread("picture.jpg");  
  
subplot(1,1,1)  
  
imshow(Image)
```



b. load *TheySay.mp3*, sound and display sampling frequency. (Hint:What is the sampling frequency? Search on the Internet)

载入声音文件 (*TheySay.mp3*) , 播放并输出采样频率

```
[y,Fs] = audioread("TheySay.mp3");  
sound(y,Fs);  
disp(Fs)
```

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