

实验一 Matlab 运算基础

1. 先求下列表达式的值，然后显示 MATLAB 工作空间的使用情况并保存全部变量。

$$(1) z_1 = \frac{2\sin 85^\circ}{1+e^2}$$

```
>> z1=(2*sin(85*pi/180))/(1+exp(1)^2)
```

```
z1 =
```

```
0.2375
```

$$(2) z_2 = \frac{1}{2} \ln(x + \sqrt{1+x^2}), \text{ 其中 } x = \begin{bmatrix} 2 & 1+2i \\ -0.45 & 5 \end{bmatrix}$$

```
>> x=[2,1+2i;-0.45,5]
```

```
z2=1/2*log(x+sqrt(1+x^2))
```

```
x =
```

```
2.0000    1.0000 + 2.0000i  
-0.4500    5.0000
```

```
z2 =
```

```
0.7114 - 0.0253i    0.8968 + 0.3658i  
0.2139 + 0.9343i    1.1541 - 0.0044i
```

$$(3) z_3 = \frac{e^{0.3a} - e^{-0.3a}}{2} \sin(a+0.3) + \ln \frac{0.3+a}{2}, \quad a = -3.0, -2.9, -2.8, \dots, 2.9, 3.0$$

提示：利用冒号表达式生成 a 向量，求个点的函数值时用点乘运算。

```
>> a=-3.0:0.1:3.0
```

```
z3=(exp(0.3.*a)-exp(-0.3.*a)).*sin(a+0.3)/2+log((0.3+a)/2)
```

$$(4) z_4 = \begin{cases} t^2 & 0 \leq t < 1 \\ t^2 - 1 & 1 \leq t < 2 \\ t^2 - 2t + 1 & 2 \leq t < 3 \end{cases}, \text{ 其中 } t = 0:0.5:2.5$$

```
>> z4=(t.^2).*(t>=0&t<1)+(t.^2-1).*(t>=1&t<2)+(t.^2-2.*t+1).*(t>=2&t<3)
```

```
z4 =
```

```
0    0.2500    0    1.2500    1.0000    2.2500
```

2. 已知: $A = \begin{bmatrix} 12 & 34 & -4 \\ 34 & 7 & 87 \\ 3 & 65 & 7 \end{bmatrix}$, $B = \begin{bmatrix} 1 & 3 & -1 \\ 2 & 0 & 3 \\ 3 & -2 & 7 \end{bmatrix}$

求下列表达式的值:

(1) $A+6*B$ 和 $A-B+I$ (其中 I 为单位矩阵)

```
>> A=[12,34,-4;34,7,87;3,65,7]
```

```
B=[1,3,-1;2,0,3;3,-2,7]
```

```
Q=A+6.*B
```

```
W=A-B+eye(3)
```

```
A =
```

```
12    34    -4
34     7    87
 3    65     7
```

```
B =
```

```
1     3    -1
2     0     3
3    -2     7
```

```
Q =
```

```
18    52   -10
46     7   105
21    53    49
```

```
W =
```

```
12    31    -3
32     8    84
 0    67     1
```

(2) $A*B$ 和 $A.*B$

```
>> E=A*B
```

```
R=A.*B
```

```
E =
```

68	44	62
309	-72	596
154	-5	241

```
R =
```

12	102	4
68	0	261
9	-130	49

(3) A^3 和 $A.^3$

```
>> I=A^3
```

```
Y=A.^3
```

```
I =
```

37226	233824	48604
247370	149188	600766
78688	454142	118820

```
Y =
```

1728	39304	-64
39304	343	658503
27	274625	343

(4) A/B 及 $B\backslash A$

```
>> U=A/B
```

```
I=B/A
```

```
U =
```

```
16.4000 -13.6000 7.6000  
35.8000 -76.2000 50.2000  
67.0000 -134.0000 68.0000
```

```
I =
```

```
0.1027 -0.0062 -0.0069  
0.0617 0.0403 -0.0366  
0.0205 0.0855 -0.0507
```

(5) [A,B]和[A([1,3],:);B^2]

```
>> O=[A,B]
```

```
P=[A([1,3],:);B^2]
```

```
O =
```

```
12 34 -4 1 3 -1  
34 7 87 2 0 3  
3 65 7 3 -2 7
```

```
P =
```

```
12 34 -4  
3 65 7  
4 5 1  
11 0 19  
20 -5 40
```

3. 设有矩阵 A 和 B

$$A = \begin{bmatrix} 1 & 2 & 3 & 4 & 5 \\ 6 & 7 & 8 & 9 & 10 \\ 11 & 12 & 13 & 14 & 15 \\ 16 & 17 & 18 & 19 & 20 \\ 21 & 22 & 23 & 24 & 25 \end{bmatrix}, \quad B = \begin{bmatrix} 3 & 0 & 16 \\ 17 & -6 & 9 \\ 0 & 23 & -4 \\ 9 & 7 & 0 \\ 4 & 13 & 11 \end{bmatrix}$$

(1) 求它们的乘积 C。

```
>> A=[1, 2, 3, 4, 5; 6, 7, 8, 9, 10; 11, 12, 13, 14, 15; 16, 17, 18, 19, 20; 21, 22, 23, 24, 25]
B=[3, 0, 16; 17, -6, 9; 0, 23, -4; 9, 7, 0; 4, 13, 11]
C=A*B
```

A =

1	2	3	4	5
6	7	8	9	10
11	12	13	14	15
16	17	18	19	20
21	22	23	24	25

B =

3	0	16
17	-6	9
0	23	-4
9	7	0
4	13	11

C =

93	150	77
258	335	287
423	520	397
588	705	557
753	890	717

(2) 将矩阵 C 的右下角 3×2 子矩阵赋给 D。

```
>> D=C(3:5, 2:3)
```

D =

520	397
705	557
890	717

(3) 查看 MATLAB 工作空间的使用情况。

```
>> feature('memstats')
```

Physical Memory (RAM):

In Use:	6374 MB (18e623000)
Free:	9889 MB (26a11a000)
Total:	16263 MB (3f873d000)

Page File (Swap space):

In Use:	8061 MB (1f7d35000)
Free:	17930 MB (460a08000)
Total:	25991 MB (65873d000)

Virtual Memory (Address Space):

In Use:	5661 MB (161dff000)
Free:	134212065 MB (7ffe9e1e1000)
Total:	134217727 MB (7fffffff0000)

Largest Contiguous Free Blocks:

1. [at 18007c000]	134166493 MB (7ff37dd04000)
2. [at 7ff5ffff3000]	21083 MB (525bed000)
3. [at 7ffe9000]	3072 MB (c0017000)
4. [at 140029000]	1023 MB (3ffd7000)
5. [at 7ffb25cfc000]	1012 MB (3f464000)
6. [at 7ffb651a5000]	305 MB (1316b000)
7. [at 5d369000]	260 MB (10487000)
8. [at 7ffb78352000]	161 MB (alce000)
9. [at 71196000]	113 MB (716a000)
10. [at 7ffb85847000]	105 MB (69d9000)

=====

134193632 MB (7ffa1e046000)

```
ans =
```

```
1.4068e+014
```

4. 完成下列操作:

(1) 求[100,999]之间能被21整除的数的个数。

提示: 先利用冒号表达式, 再利用 find 和 length 函数

```
>> f=100:1:999;
```

```
F=mod(f,21) N1 =
```

```
N=find(F)
```

```
N1=900-length(N) 43
```

(2) 建立一个字符串向量, 删除其中的大写字母。提示: 再利用 find 和空矩阵

```
k =
```

```
5 7 12
```

```
>> s='haveAaBgoodCday'
```

```
s =
```

```
k=find('A' <=s<='Z')
```

```
haveagoodday
```

```
s(k)=[]
```