PENGOLAHAN CITRA DIGITAL

Diajukan Untuk Memenuhi Salah Satu Tugas Mata Kuliah
Pengolahan Citra Digital Pada Program Studi PTIK
Fakultas Teknik Universitas Negeri Makassar

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Soal Latihan

1. Hitunglah dengan MATLAB:
   $12 / 3{,}5 \quad (3 + 5/4)^2 \quad (0{,}25^2 + 0{,}75^2)^{1/2} \quad 2 / (6/0{,}3)$

2. Buatlah empat variabel berikut:
   A = 25 B = 50 C = 125 D = 89
   Hitunglah dan simpan dalam variabel baru:
   X = A + B +C Y = A / (D+B)
   $Z = D^{A/B} + C$

3. Manakah di antara nama-nama variabel berikut yang valid ?
   luas, **kel_1**, **2_data**, **diff:3**, **Time**, **time_from_start**, **10_hasil_terakhir, nilai-awal**

4. Misalkan: $x = \pi/6$, $y = 0{,}001$; hitunglah:
   $\sqrt{y} \quad e^{-x} \quad \sin x \quad \cos 2x \quad \tan 3x$
   $\log_{10} y \quad \log_2 y \quad \ln y$

5. Misalkan: $p = 9+16i$ dan $q = -9+16i$; hitunglah:
   $r = pq \quad s = \frac{p}{q} \quad p - r \quad r + s \quad p^2 \quad \sqrt{q}$
   $|p| \quad \angle p \quad |q| \quad \angle q \quad |r| \quad \angle r \quad |s| \quad \angle s$

JAWABAN SOAL HAL. 22

1.
```
>> (3 + 5/4)^2

ans =

   18.0625


>> 12/3.5

ans =

    3.4286


>> (0.25^2 + 0.75^2)^1/2

ans =

    0.3125


>> 2/(6/0.3)

ans =

    0.1000
```

2.
```
>> A=25, B=50, C=125, D=89

A =

    25

B =

    50

C =

   125

D =

    89

>> X= A+B+C

X =

   200


>> Z=D^A/B+C, Y=A/(D+B)

Z =

   1.0859e+47

Y =

    0.1799
```

3. Nama-anama variabel yang termasuk nama variabel valid yaitu:

- **luas** : Valid, karena telah memenuhi syarat penamaan variabel pada matlab.
- **kel_1** : Valid, karena telah memenuhi syarat penamaan variabel pada matlab.
- **2_data** : Tidak valid, karena diawali dengan angka.
- **diff:3** : Tidak valid, karena terdapat titik dua.
- **Time** : Valid, karena telah memenuhi syarat penamaan variabel pada matlab.
- **time_from_start** : Valid, karena telah memenuhi syarat penamaan variabel pada matlab.
- **10_hasil_terakhir** : Tidak valid, karena diawali dengan angka.

4.
```
>> sqrt(y)

ans =

    0.0316

>> exp(-x)

ans =

    0.5924


>> sin(x)

ans =

    0.5000


>> cos(2*x)

ans =

    0.5000


>> tan(3*x)

ans =

   1.6331e+16


>> log10(y)

ans =

    -3


>> log2(y)

ans =

   -9.9658

>> log(y)

ans =

   -6.9078
```

5.
```
>> p=9+16i, q=-9+16i

p =

   9.0000 +16.0000i

q =

  -9.0000 +16.0000i

>> r=p*q, s=p/q, p-r, r+s, p^2, sqrt(q)

r =

  -337

s =

   0.5193 - 0.8546i

ans =

   3.4600e+02 + 1.6000e+01i

ans =

  -3.3648e+02 - 8.5460e-01i

ans =

  -1.7500e+02 + 2.8800e+02i

ans =

   2.1630 + 3.6985i

>> abs(p), angle(p)

ans =

   18.3576

ans =

    1.0584

>> abs(q), angle(q)

ans =

   18.3576

ans =

    2.0832

>> abs(r), angle(r)

ans =

   337

ans =

    3.1416
```

Soal Latihan

1. Definisikan vektor dan matriks berikut ini di dalam MATLAB:

$$\begin{pmatrix}10 & 20 & 30 & 40\end{pmatrix} \quad \begin{pmatrix}-5\\-15\\-40\end{pmatrix} \quad \begin{pmatrix}1 & 3 & 5 & 0\\3 & 1 & 3 & 5\\5 & 3 & 1 & 3\\0 & 5 & 3 & 1\end{pmatrix}$$

2. Gabungkan matriks **A** dan **B** berikut ini:

$$A=\begin{pmatrix}4 & 8\\2 & 4\end{pmatrix} \quad B=\begin{pmatrix}1 & 1\\1 & -1\end{pmatrix}$$ menjadi:

$$C=\begin{pmatrix}A & B\end{pmatrix} \quad W=\begin{pmatrix}B & B\\B & -B\end{pmatrix}$$

3. Hitunglah:
   a. Masing-masing ukuran vektor/matriks pada soal no.1 dan no. 2 di atas
   b. Masing-masing jumlah elemen vektor/matriks pada soal no.1 dan no.2 di atas.

4. Buatlah matriks-matriks berikut dengan *command* **ones**, **zeros**, dan **eye**:

$$\begin{pmatrix}5 & 0 & 0 & 0\\0 & 5 & 0 & 0\\0 & 0 & 5 & 0\\0 & 0 & 0 & 5\end{pmatrix} \quad \begin{pmatrix}5 & 5 & 0 & 0\\5 & 5 & 0 & 0\\-5 & 0 & 0 & 5\\0 & -5 & 5 & 0\end{pmatrix}$$

5. Buatlah vektor berukuran 100 berisi bilangan acak gaussian dengan mean = 1 dan variansi = 0,2.

6. Buatlah matriks **M** berikut ini:

$$M=\begin{pmatrix}1 & 5 & 10 & 15 & 20\\1 & 2 & 4 & 8 & 16\\-3 & 0 & 3 & 6 & 9\\32 & 16 & 8 & 4 & 2\\5 & -5 & 5 & -5 & 5\end{pmatrix}$$

Buatlah vektor / matriks baru berisi:

- baris pertama dari **M**
- kolom ketiga dari **M**
- baris ketiga hingga kelima, kolom kedua hingga keempat dari **M**
- elemen pada diagonal utama dari **M**

7. Buatlah deret berikut ini dengan operator titik-dua, **linspace**, dan **logspace**:
   x = -10, -9, -8, ... , 8, 9, 10
   y = 7,5 , 7,0 , 6,5 , 6,0 , ... , 0,5 , 0
   z = 1, 4, 7, 10, 13, ... , 100
   w = 0,001 , 0,01 , 0,1 , 1 , 10 , ... , 10^6

8. Buatlah matriks **N** yang berisi kolom pertama hingga keempat dari matriks **M** pada no.6 di atas. Bentuk-ulang matriks **N** tersebut menjadi matriks baru seperti berikut ini:
   - kolom pertama ditukar dengan kolom keempat, kolom kedua ditukar dengan kolom ketiga
   - baris pertama ditukan dengan baris kelima, baris kedua ditukar dengan baris keempat
   - matriks berukuran 10×2
   - matriks berukuran 4×5

JAWABAN SOAL HAL. 34

1.
```
>> vektor1=[10,20,30,40]

vektor1 =

    10    20    30    40

>> vektor2=[-5;-15;-40]

vektor2 =

    -5
   -15
   -40

>> matriks=[1 3 5 0;3 1 3 5;5 3 1 3;0 5 3
   1]

matriks =

     1     3     5     0
     3     1     3     5
     5     3     1     3
     0     5     3     1
```

2.
```
>> A=[4 8;2 4]; B=[1 1;1 -1]

B =

     1     1
     1    -1


>> A=[4 8; 2 4]

A =

     4     8
     2     4


>> B=[1 1; 1 -1]

B =

     1     1
     1    -1


>> C=[A B]

C =

     4     8     1     1
     2     4     1    -1
```

3. a) Ukuran vektor/matriksnya

- **Soal no.1:**

```
>> length(vektor1)

ans =

     4


>> length(vektor2)

ans =

     3


>> size(matriks)

ans =

     4     4
```

- **Soal no. 2:**

```
>> size(matriksC)

ans =

     2     4


>> matriksW=[1 1 1 1; 1 -1 1 -1; 1 1 -1
   -1; 1 -1 -1 1]

matriksW =

     1     1     1     1
     1    -1     1    -1
     1     1    -1    -1
     1    -1    -1     1


>> size(matriksW)

ans =

     4     4
```

b) Jumlah elemen vektor/matriksnya

- **Soal no. 1:**

```
>> jumlah_elemen=prod(length(vektor1))

jumlah_elemen =

     4


>> jumlah_elemen=prod(length(vektor2))

jumlah_elemen =

     3


>> jumlah_elemen=prod(size(matriks))

jumlah_elemen =

    16
```

- **Soal no 2:**

```
>> jumlah_elemen=prod(size(matriksC))

jumlah_elemen =

     8


>> jumlah_elemen=prod(size(matriksW))

jumlah_elemen =

    16
```

4. - matriks 1

```
>> ones(4)

ans =

     1     1     1     1
     1     1     1     1
     1     1     1     1
     1     1     1     1


>> zeros(4)

ans =

     0     0     0     0
     0     0     0     0
     0     0     0     0
     0     0     0     0


>> eye(4)

ans =

     1     0     0     0
     0     1     0     0
     0     0     1     0
     0     0     0     1
```

- matriks 2

```
>> ones(4)

ans =

     1     1     1     1
     1     1     1     1
     1     1     1     1
     1     1     1     1


>> zeros(4)

ans =

     0     0     0     0
     0     0     0     0
     0     0     0     0
     0     0     0     0


>> eye(4)

ans =

     1     0     0     0
     0     1     0     0
     0     0     1     0
     0     0     0     1
```

Karena kedua matriks sama-sama berukuran 4 x 4, maka ones, zeros, dan eye dari kedua matriksnya pun juga sama.

5.

```
>> mean=1; variasi=0.2

variasi =

    0.2000


>> bil_acak_gaussian=sqrt(variasi)*randn(1
   ,100)+mean

bil_acak_gaussian =

  Columns 1 through 4

    1.2405    1.8201   -0.0102    1.3856

  Columns 5 through 8

    1.1426    0.4152    0.8061    1.1532

  Columns 9 through 12

    2.6003    2.2385    0.3963    2.3573

  Columns 13 through 16

    1.3244    0.9718    1.3196    0.9083

  Columns 17 through 20

    0.9445    1.6662    1.6301    1.6338

  Columns 21 through 24

    1.3003    0.4600    1.3208    1.7291
```

```
  Columns 25 through 28

    1.2186    1.4627    1.3251    0.8643

  Columns 29 through 32

    1.1314    0.6479    1.3973    0.4870

  Columns 33 through 36

    0.5220    0.6380   -0.3167    1.6433

  Columns 37 through 40

    1.1454    0.6624    1.6128    0.2346

  Columns 41 through 44

    0.9543    0.8920    1.1428    1.1399

  Columns 45 through 48

    0.6132    0.9866    0.9263    1.2807

  Columns 49 through 52

    1.4889    1.4961    0.6138    1.0346

  Columns 53 through 56

    0.4570    0.5020    0.9969    1.6854

  Columns 57 through 60

    0.6558    1.1661    0.8991    1.4997

  Columns 61 through 64

    0.5130    1.0146    1.2471    1.4922
```

```
Columns 65 through 68

  1.6906    1.0384    0.3329    0.6680

Columns 69 through 72

  0.5252    2.0512    0.7247    1.3346

Columns 73 through 76

  0.9139    1.3974    0.6579    0.3729

Columns 77 through 80

  0.3639    1.2183    0.9207    0.9123

Columns 81 through 84

  1.6347    1.1304    1.0885    1.7100

Columns 85 through 88

  0.6402    1.3115    1.3735    0.8910

Columns 89 through 92

  1.0965    0.4786    0.4866    1.0469

Columns 93 through 96

  1.3230    2.1563    0.7018    1.0838

Columns 97 through 100

  0.9631    0.1355    0.8037    0.1974
```

6.

```
>> M=[1 5 10 15 20; 1 2 4 8 16; -3 0 3 6
   9; 32 16 8 4 2; 5 -5 5 -5 5]

M =

     1     5    10    15    20
     1     2     4     8    16
    -3     0     3     6     9
    32    16     8     4     2
     5    -5     5    -5     5


>> M(1,:)

ans =

     1     5    10    15    20


>> M(:,3)

ans =

    10
     4
     3
     8
     5
```

```
>> M(3:5,2:4)

ans =

     0     3     6
    16     8     4
    -5     5    -5


>> Matriks_2=[M(1,1) M(2,2) M(3,3) M(4,4)
   M(5,5) M(5,1) M(4,2) M(3,3) M(2,4)
   M(1,5)]

Matriks_2 =

  Columns 1 through 6

     1     2     3     4     5     5

  Columns 7 through 10

    16     3     8    20
```

7.

```
>> X=-10:1:10

X =
  Columns 1 through 6
   -10    -9    -8    -7    -6    -5
  Columns 7 through 12
    -4    -3    -2    -1     0     1
  Columns 13 through 18
     2     3     4     5     6     7
  Columns 19 through 21
     8     9    10

>> linspace(-10,10,21)

ans =
  Columns 1 through 6
   -10    -9    -8    -7    -6    -5
  Columns 7 through 12
    -4    -3    -2    -1     0     1
  Columns 13 through 18
     2     3     4     5     6     7
  Columns 19 through 21
     8     9    10

>> Y=7.5:-0.5:0

Y =
  Columns 1 through 4
    7.5000    7.0000    6.5000    6.0000
  Columns 5 through 8
    5.5000    5.0000    4.5000    4.0000
  Columns 9 through 12
    3.5000    3.0000    2.5000    2.0000
  Columns 13 through 16
    1.5000    1.0000    0.5000         0

>> linspace(7.5,0,16)

ans =
  Columns 1 through 4
    7.5000    7.0000    6.5000    6.0000
  Columns 5 through 8
    5.5000    5.0000    4.5000    4.0000
  Columns 9 through 12
    3.5000    3.0000    2.5000    2.0000
  Columns 13 through 16
    1.5000    1.0000    0.5000         0
```

```
>> Z=1:3:100

Z =
  Columns 1 through 6
     1     4     7    10    13    16
  Columns 7 through 12
    19    22    25    28    31    34
  Columns 13 through 18
    37    40    43    46    49    52
  Columns 19 through 24
    55    58    61    64    67    70
  Columns 25 through 30
    73    76    79    82    85    88
  Columns 31 through 34
    91    94    97   100

>> linspace(1,100,34)

ans =
  Columns 1 through 6
     1     4     7    10    13    16
  Columns 7 through 12
    19    22    25    28    31    34
  Columns 13 through 18
    37    40    43    46    49    52
  Columns 19 through 24
    55    58    61    64    67    70
  Columns 25 through 30
    73    76    79    82    85    88
  Columns 31 through 34
    91    94    97   100

>> logspace(-3,6,10)

ans =
   1.0e+06 *
  Columns 1 through 4
    0.0000    0.0000    0.0000    0.0000
  Columns 5 through 8
    0.0000    0.0001    0.0010    0.0100
  Columns 9 through 10
    0.1000    1.0000
```

8.
```
>> N=[1 5 10 15; 1 2 4 8; -3 0 3 6; 32 16
   8 4; 5 -5 5 -5]

N =

     1     5    10    15
     1     2     4     8
    -3     0     3     6
    32    16     8     4
     5    -5     5    -5


>> fliplr(N)

ans =

    15    10     5     1
     8     4     2     1
     6     3     0    -3
     4     8    16    32
    -5     5    -5     5


>> flipud(N)

ans =

     5    -5     5    -5
    32    16     8     4
    -3     0     3     6
     1     2     4     8
     1     5    10    15

>> reshape(N,10,2)

ans =

     1    10
     1     4
    -3     3
    32     8
     5     5
     5    15
     2     8
     0     6
    16     4
    -5    -5


>> reshape(N,4,5)

ans =

     1     5    16     3     8
     1     5    -5     8     6
    -3     2    10     5     4
    32     0     4    15    -5
```

Soal Latihan

1. Operasikan matriks **M** dan **N** berikut ini:

   $$M = \begin{pmatrix} 10 & 20 \\ 5 & 8 \end{pmatrix} \quad N = \begin{pmatrix} -1 & 1 \\ 1 & -1 \end{pmatrix}$$

   M + **N**, **M** – **N**, **N** + 9
   MN, **NM**

2. Hitunglah dot-product dan cross-product dari dua vektor berikut ini:

   $\vec{a} = (0 \quad 5 \quad 5) \quad \vec{b} = (1 \quad 1 \quad 1)$

   $\vec{a} \bullet \vec{b} \quad \vec{a} \times \vec{b} \quad \vec{b} \times \vec{a}$

3. Pecahkanlah persamaan linier tiga variabel berikut ini:

   $x + 2y - 3z = -7$
   $4x + 5y + 6z = 11$
   $7x + 8y + 9z = 17$

4. Carilah solusi dari persamaan lingkaran berikut ini:

   $y = \sqrt{25 - x^2}$ untuk $-5 \le x \le 5$, dengan inkremen x sebesar 0,05. Setelah itu, tampilkanlah nilai y pada rentang $x = 0$ hingga $x = 1$ saja.

5. Buatlah tabel hiperbolik-trigonometri: sinh, cosh, dan tanh untuk rentang $-5 \le x \le 5$, dengan inkremen x sebesar 0,1.

JAWABAN SOAL HAL. 47

1.
```
>> m=[10 20; 5 8]; n=[-1 1; 1 -1]

n =

    -1     1
     1    -1


>> jumlah=m+n, selisih=m-n, tambah9=n+9,
   Multmn=m*n, Multnm=n*m

jumlah =

     9    21
     6     7


selisih =

    11    19
     4     9


tambah9 =

     8    10
    10     8


Multmn =

    10   -10
     3    -3


Multnm =

    -5   -12
     5    12
```

2.
```
>> a=[0 5 5]; b=[1 1 1];
>> dot(a,b), cross(a,b), cross(b,a)

ans =

    10


ans =

     0     5    -5


ans =

     0    -5     5
```

3.
```
>> A=[1 2 -3; 4 5 6; 7 8 9];
>> b=[-7; 11; 17];
>> x=inv(A)*b

x =

    1.0000
   -1.0000
    2.0000
```

4.
```
>> x=[-5:0.05:5]';
>> y=sqrt(25-x.^2);
>> pj=length(x);
>> awal=round(pj/2); akhir=awal+1/0.05;
   [x(awal:akhir), y(awal:akhir)]

ans =

         0    5.0000
    0.0500    4.9997
    0.1000    4.9990
    0.1500    4.9977
    0.2000    4.9960
    0.2500    4.9937
    0.3000    4.9910
    0.3500    4.9877
    0.4000    4.9840
    0.4500    4.9797
    0.5000    4.9749
    0.5500    4.9697
    0.6000    4.9639
    0.6500    4.9576
    0.7000    4.9508
    0.7500    4.9434
    0.8000    4.9356
    0.8500    4.9272
    0.9000    4.9183
    0.9500    4.9089
    1.0000    4.8990
```

5.
```
>> x=-5:0.1:5;
>> sinus=sinh(x); cosinus=cosh(x);
   tangent=tanh(x); [x' sinus' cosinus'
   tangent']

ans =

   -5.0000  -74.2032   74.2099   -0.9999
   -4.9000  -67.1412   67.1486   -0.9999
   -4.8000  -60.7511   60.7593   -0.9999
   -4.7000  -54.9690   54.9781   -0.9998
   -4.6000  -49.7371   49.7472   -0.9998
   -4.5000  -45.0030   45.0141   -0.9998
   -4.4000  -40.7193   40.7316   -0.9997
   -4.3000  -36.8431   36.8567   -0.9996
   -4.2000  -33.3357   33.3507   -0.9996
   -4.1000  -30.1619   30.1784   -0.9995
   -4.0000  -27.2899   27.3082   -0.9993
   -3.9000  -24.6911   24.7113   -0.9992
   -3.8000  -22.3394   22.3618   -0.9990
   -3.7000  -20.2113   20.2360   -0.9988
   -3.6000  -18.2855   18.3128   -0.9985
   -3.5000  -16.5426   16.5728   -0.9982
   -3.4000  -14.9654   14.9987   -0.9978
   -3.3000  -13.5379   13.5748   -0.9973
   -3.2000  -12.2459   12.2866   -0.9967
   -3.1000  -11.0765   11.1215   -0.9959
   -3.0000  -10.0179   10.0677   -0.9951
   -2.9000   -9.0596    9.1146   -0.9940
   -2.8000   -8.1919    8.2527   -0.9926
   -2.7000   -7.4063    7.4735   -0.9910
   -2.6000   -6.6947    6.7690   -0.9890
   -2.5000   -6.0502    6.1323   -0.9866
   -2.4000   -5.4662    5.5569   -0.9837
   -2.3000   -4.9370    5.0372   -0.9801
   -2.2000   -4.4571    4.5679   -0.9757
   -2.1000   -4.0219    4.1443   -0.9705
   -2.0000   -3.6269    3.7622   -0.9640
   -1.9000   -3.2682    3.4177   -0.9562
   -1.9000   -3.2682    3.4177   -0.9562
   -1.8000   -2.9422    3.1075   -0.9468
   -1.7000   -2.6456    2.8283   -0.9354
   -1.6000   -2.3756    2.5775   -0.9217
   -1.5000   -2.1293    2.3524   -0.9051
   -1.4000   -1.9043    2.1509   -0.8854
   -1.3000   -1.6984    1.9709   -0.8617
   -1.2000   -1.5095    1.8107   -0.8337
   -1.1000   -1.3356    1.6685   -0.8005
   -1.0000   -1.1752    1.5431   -0.7616
   -0.9000   -1.0265    1.4331   -0.7163
   -0.8000   -0.8881    1.3374   -0.6640
   -0.7000   -0.7586    1.2552   -0.6044
   -0.6000   -0.6367    1.1855   -0.5370
   -0.5000   -0.5211    1.1276   -0.4621
   -0.4000   -0.4108    1.0811   -0.3799
   -0.3000   -0.3045    1.0453   -0.2913
   -0.2000   -0.2013    1.0201   -0.1974
   -0.1000   -0.1002    1.0050   -0.0997
         0         0    1.0000         0
    0.1000    0.1002    1.0050    0.0997
    0.2000    0.2013    1.0201    0.1974
    0.3000    0.3045    1.0453    0.2913
    0.4000    0.4108    1.0811    0.3799
    0.5000    0.5211    1.1276    0.4621
    0.6000    0.6367    1.1855    0.5370
    0.7000    0.7586    1.2552    0.6044
    0.8000    0.8881    1.3374    0.6640
    0.9000    1.0265    1.4331    0.7163
    1.0000    1.1752    1.5431    0.7616
    1.1000    1.3356    1.6685    0.8005
    1.2000    1.5095    1.8107    0.8337
    1.3000    1.6984    1.9709    0.8617
    1.4000    1.9043    2.1509    0.8854
    1.5000    2.1293    2.3524    0.9051
    1.6000    2.3756    2.5775    0.9217
    1.7000    2.6456    2.8283    0.9354
    1.8000    2.9422    3.1075    0.9468
    1.9000    3.2682    3.4177    0.9562
    2.0000    3.6269    3.7622    0.9640
    2.1000    4.0219    4.1443    0.9705
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2.1000	4.0219	4.1443	0.9705
2.2000	4.4571	4.5679	0.9757
2.3000	4.9370	5.0372	0.9801
2.4000	5.4662	5.5569	0.9837
2.5000	6.0502	6.1323	0.9866
2.6000	6.6947	6.7690	0.9890
2.7000	7.4063	7.4735	0.9910
2.8000	8.1919	8.2527	0.9926
2.9000	9.0596	9.1146	0.9940
3.0000	10.0179	10.0677	0.9951
3.1000	11.0765	11.1215	0.9959
3.2000	12.2459	12.2866	0.9967
3.3000	13.5379	13.5748	0.9973
3.4000	14.9654	14.9987	0.9978
3.5000	16.5426	16.5728	0.9982
3.6000	18.2855	18.3128	0.9985
3.7000	20.2113	20.2360	0.9988
3.8000	22.3394	22.3618	0.9990
3.9000	24.6911	24.7113	0.9992
4.0000	27.2899	27.3082	0.9993
4.1000	30.1619	30.1784	0.9995
4.2000	33.3357	33.3507	0.9996
4.3000	36.8431	36.8567	0.9996
4.4000	40.7193	40.7316	0.9997
4.5000	45.0030	45.0141	0.9998
4.6000	49.7371	49.7472	0.9998
4.7000	54.9690	54.9781	0.9998
4.8000	60.7511	60.7593	0.9999
4.9000	67.1412	67.1486	0.9999
5.0000	74.2032	74.2099	0.9999