Roll. No. A016	Name: Varun Khadayate
Class B.Tech CsBs	Batch: 1
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1. The sum of a geometric series

$$1+r+r^2+r^3+\ldots\ldots\ldots+r^n= (1-r^N)/(1-r);$$

N=number of terms in a series.

Accept the value of r and n as input from keyboard. Verify the above equation

```
r = 2

r =

    2

>> N = 20

N =

   20

>> x = (1-r^N)/(1-r)

x =

    1048575
>> y = sum(r.^(0:N-1))

y =

    1048575

>> logical(x == y)

ans =

  logical

   1
```

2. Accept a square matrix A of any size from keyboard.

```
>> A = [9,9,3;7,2,7;2,8,5]

A =

   9   9   3
   7   2   7
   2   8   5
```

Find:

a. Size of A matrix

```
>> size(A)

ans =

   3   3
```

b. Determinant of A matrix

```
>> det(A)

ans =

 -447.0000
```

c. Display whether matrix A is singular or not

```
>> cond(A)

ans =

   4.0913
```

d. Transpose of A matrix

```
>> B = transpose(A)

B =

   9   7   2
   9   2   8
   3   7   5
```

e. Perform A+A', A-A'

```
>> C = A + B

C =

   18   16    5
   16    4   15
    5   15   10

>> D = A - B

D =

    0    2    1
   -2    0   -1
   -1    1    0
```

f. Find inverse of A matrix

```
>> inv(A)

ans =

   0.1029    0.0470   -0.1275
   0.0470   -0.0872    0.0940
  -0.1163    0.1208    0.1007
```

g. Perform A*A' and A.*A'

```
>> A*B

ans =

  171   102   105
  102   102    65
  105    65    93
>> A.*B

ans =

   81    63     6
   63     4    56
    6    56    25
```

h. Find square of A matrix

i. >> F = A*A
j.
k. F =
l.

```
m.    150   123   105
n.     91   123    70
o.     84    74    87
```

p. Find rank of A matrix

```
>> rank (A)

ans =

   3
```

q. Find eigenvalues and eigenvectors of A matrix

```
>> eig(A)

ans =

  17.5118
   4.3526
  -5.8644

>> [V,D] = eig(A)

V =

  -0.7183   -0.6835    0.3698
  -0.5284    0.1125   -0.7794
  -0.4527    0.7213    0.5058


D =

  17.5118         0         0
        0    4.3526         0
        0         0   -5.8644
```

3. Create a vector and a matrix with the following commands: v=0:0.2:12 and M=[sin(v); cos(v)]. Find the sizes of v and M and extract the first 10 elements of each row of the matrix and display them as column vectors.

```
>> v=0:0.2:12

v =

  Columns 1 through 12

         0    0.2000    0.4000    0.6000    0.8000    1.0000    1.2000    1.4000    1.6000    1.8000
2.0000    2.2000

  Columns 13 through 24

    2.4000    2.6000    2.8000    3.0000    3.2000    3.4000    3.6000    3.8000    4.0000
4.2000    4.4000    4.6000

  Columns 25 through 36

    4.8000    5.0000    5.2000    5.4000    5.6000    5.8000    6.0000    6.2000    6.4000
6.6000    6.8000    7.0000

  Columns 37 through 48

    7.2000    7.4000    7.6000    7.8000    8.0000    8.2000    8.4000    8.6000    8.8000
9.0000    9.2000    9.4000

  Columns 49 through 60

    9.6000    9.8000   10.0000   10.2000   10.4000   10.6000   10.8000   11.0000   11.2000
11.4000   11.6000   11.8000

  Column 61

   12.0000

>> M=[sin(v); cos(v)]

M =

  Columns 1 through 12

         0    0.1987    0.3894    0.5646    0.7174    0.8415    0.9320    0.9854    0.9996    0.9738
0.9093    0.8085
    1.0000    0.9801    0.9211    0.8253    0.6967    0.5403    0.3624    0.1700   -0.0292   -
0.2272   -0.4161   -0.5885

  Columns 13 through 24

    0.6755    0.5155    0.3350    0.1411   -0.0584   -0.2555   -0.4425   -0.6119   -0.7568   -
0.8716   -0.9516   -0.9937
```

```
  -0.7374  -0.8569  -0.9422  -0.9900  -0.9983  -0.9668  -0.8968  -0.7910  -0.6536  -
0.4903  -0.3073  -0.1122

  Columns 25 through 36

  -0.9962  -0.9589  -0.8835  -0.7728  -0.6313  -0.4646  -0.2794  -0.0831   0.1165
0.3115   0.4941   0.6570
   0.0875   0.2837   0.4685   0.6347   0.7756   0.8855   0.9602   0.9965   0.9932
0.9502   0.8694   0.7539

  Columns 37 through 48

   0.7937   0.8987   0.9679   0.9985   0.9894   0.9407   0.8546   0.7344   0.5849
0.4121   0.2229   0.0248
   0.6084   0.4385   0.2513   0.0540  -0.1455  -0.3392  -0.5193  -0.6787  -0.8111  -
0.9111  -0.9748  -0.9997

  Columns 49 through 60

  -0.1743  -0.3665  -0.5440  -0.6999  -0.8278  -0.9228  -0.9809  -1.0000  -0.9792  -
0.9193  -0.8228  -0.6935
  -0.9847  -0.9304  -0.8391  -0.7143  -0.5610  -0.3853  -0.1943   0.0044   0.2030
0.3935   0.5683   0.7204

  Column 61

  -0.5366
   0.8439

>> size(v)

ans =

    1   61

>> size(M)

ans =

    2   61

>> M(:,1:10)

ans =

       0   0.1987   0.3894   0.5646   0.7174   0.8415   0.9320   0.9854   0.9996   0.9738
   1.0000   0.9801   0.9211   0.8253   0.6967   0.5403   0.3624   0.1700  -0.0292  -
0.2272
```

4. The polar equation of a circle is given by x=r cosθ, y=r sinθ. Take θ= 0 to 2π with step size of π/16 and plot the circle on x-y axis for given value of radius r. Give labels to axis and title to the figure. Make use of new figure and redraw the circle with distinct points shown by 'o' rather than a continuous plot. Now combine the two plots in new figure to show the line through the data points as well as the distinct data points.

```
>> theta = 0:pi/16:2*pi

theta =

  Columns 1 through 12

         0    0.1963    0.3927    0.5890    0.7854    0.9817    1.1781    1.3744    1.5708
1.7671    1.9635    2.1598

  Columns 13 through 24

    2.3562    2.5525    2.7489    2.9452    3.1416    3.3379    3.5343    3.7306    3.9270
4.1233    4.3197    4.5160

  Columns 25 through 33

    4.7124    4.9087    5.1051    5.3014    5.4978    5.6941    5.8905    6.0868    6.2832

>> x = r*cos(theta)

x =

  Columns 1 through 12

    2.0000    1.9616    1.8478    1.6629    1.4142    1.1111    0.7654    0.3902    0.0000   -
0.3902   -0.7654   -1.1111

  Columns 13 through 24

   -1.4142   -1.6629   -1.8478   -1.9616   -2.0000   -1.9616   -1.8478   -1.6629   -1.4142   -
1.1111   -0.7654   -0.3902

  Columns 25 through 33

   -0.0000    0.3902    0.7654    1.1111    1.4142    1.6629    1.8478    1.9616    2.0000

>> y = r*sin(theta)

y =

  Columns 1 through 12

         0    0.3902    0.7654    1.1111    1.4142    1.6629    1.8478    1.9616    2.0000
1.9616    1.8478    1.6629
```

```
  Columns 13 through 24

   1.4142   1.1111   0.7654   0.3902   0.0000  -0.3902  -0.7654  -1.1111  -1.4142  -
1.6629  -1.8478  -1.9616

  Columns 25 through 33

  -2.0000  -1.9616  -1.8478  -1.6629  -1.4142  -1.1111  -0.7654  -0.3902  -0.0000

>> r = 10

r =

   10

>> x = r*cos(theta)

x =

  Columns 1 through 12

  10.0000   9.8079   9.2388   8.3147   7.0711   5.5557   3.8268   1.9509   0.0000  -
1.9509  -3.8268  -5.5557

  Columns 13 through 24

  -7.0711  -8.3147  -9.2388  -9.8079 -10.0000  -9.8079  -9.2388  -8.3147  -7.0711  -
5.5557  -3.8268  -1.9509

  Columns 25 through 33

  -0.0000   1.9509   3.8268   5.5557   7.0711   8.3147   9.2388   9.8079  10.0000

>> y = r*sin(theta)

y =

  Columns 1 through 12

       0   1.9509   3.8268   5.5557   7.0711   8.3147   9.2388   9.8079  10.0000
9.8079   9.2388   8.3147

  Columns 13 through 24

   7.0711   5.5557   3.8268   1.9509   0.0000  -1.9509  -3.8268  -5.5557  -7.0711  -
8.3147  -9.2388  -9.8079

  Columns 25 through 33

 -10.0000  -9.8079  -9.2388  -8.3147  -7.0711  -5.5557  -3.8268  -1.9509  -0.0000
```

```
>> plot(x,y)
>> plot(x,y)
>> plot(x,y,'O')
>> plot(x,y,'O')
>> xlabel('X-Axis')
>> ylabel('Y-Axis')
>> title('Plot Made by Varun Khadayate A016')
```