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1. The sum of a geometric series

$$1+r+r^2+r^3+……….+r^n= (1-r^N)/(1-r);$$

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

```
>> F = A*A

F =
```

```
150  123  105
 91  123  70
 84  74   87
```

i. Find rank of A matrix

```
>> rank (A)

ans =

   3
```

j. 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')
```


Plot Made by Varun Khadayate A016