MATLAB REPORT

COURSE CODE:MAT 2001
SLOT:L9+L10

Guided by:-

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CONTENT

```
%Valiveti Manikanta Bhuvanesh
% %19bcd7088
% %Lab 1
clc
clear all
 a=4;
 b=5;
c=a+b;
A=[1 2 3 4; 5 6 7 8; 7 6 5 4; 4 3 2 1;9 8 7 6]
```

```
A = 5�4
     1     2     3     4
     5     6     7     8
     7     6     5     4
     4     3     2     1
     9     8     7     6
```

```
B=[4 5 6 7 8; 1 2 3 4 5; 9 8 7 6 5; 3 4 5 6 7]
```

```
B = 4�5
     4     5     6     7     8
     1     2     3     4     5
     9     8     7     6     5
     3     4     5     6     7
```

```
C=A*B
```

```
C = 5�5
    45    49    53    57    61
   113   125   137   149   161
    91   103   115   127   139
    40    46    52    58    64
   125   141   157   173   189
```

```
C(:,3)
```

```
ans = 5�1
    53
   137
   115
    52
   157
```

```
C(2,:)
```

```
ans = 1�5
   113   125   137   149   161
```

```
C(:,4)=[1 2 3 4 5]
```

```
C = 5�5
    45    49    53     1    61
   113   125   137     2   161
    91   103   115     3   139
    40    46    52     4    64
   125   141   157     5   189
```

```
x=[1:10:100]
```

```
x = 1�10
     1    11    21    31    41    51    61    71    81    91
```

```
y=[1:5:100]
```

```
y = 1�20
     1     6    11    16    21    26    31    36    41    46    51    56    61    66    71    7
```

```
z=[1:1:100]
```

```
z = 1�100
     1     2     3     4     5     6     7     8     9    10    11    12    13    14    15    1
```

```
p=[1:0.5:100]
```

```
p = 1�199
    1.0000    1.5000    2.0000    2.5000    3.0000    3.5000    4.0000    4.5000    5.0000    5
```

```
p=linspace(1,100,200)
```

```
p = 1�200
    1.0000    1.4975    1.9950    2.4925    2.9899    3.4874    3.9849    4.4824    4.9799    5
```

```
x=linspace(1,100,10)
```

```
x = 1�10
     1    12    23    34    45    56    67    78    89   100
```

```
y=linspace(1,100,20)
```

```
y = 1�20
    1.0000    6.2105   11.4211   16.6316   21.8421   27.0526   32.2632   37.4737   42.6842   47
```

```
z=linspace(1,100,100)
```

```
z = 1�100
     1     2     3     4     5     6     7     8     9    10    11    12    13    14    15    1
```

```
length(x)
```

```
ans = 10
```

```
length(y)
```

```
ans = 20
```

```
length(z)
```

```
ans = 100
```

```
length(p)
```

```
ans = 200
```

```
Y=x.^2
```

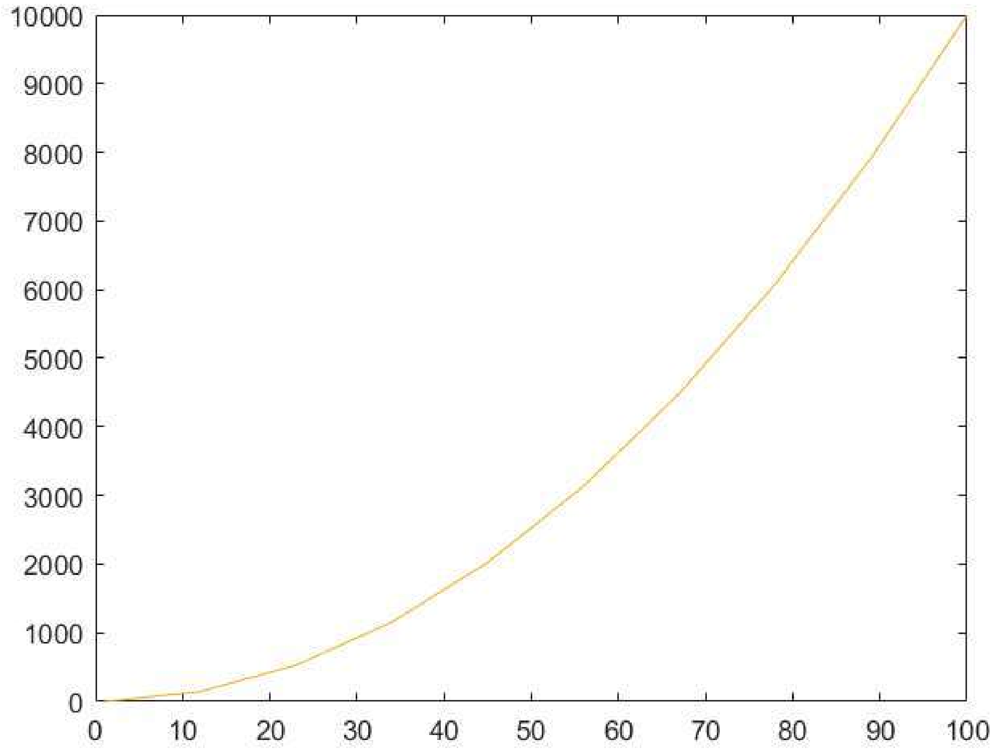
```
Y = 1�10
           1         144         529        1156        2025        3136        4489        608
```

```
plot(x,Y)
hold on
plot(x,Y)
```

```
hold on
Y=x.^2
```

```
Y = 1�10

        1         144         529        1156        2025        3136        4489        608
```

```
plot(x,Y)
```




```
%Valiveti Manikanta Bhuvanesh
%19bcd7088
%Lab 2
syms x1 x2 x3 x4
for x1=1:1:2
    x4=3*x1
    x3=4*x1
    x2=0.5*(x3+2*x4)
    disp(x1)
    disp(x2)
    disp(x3)
    disp(x4)
end
```

```
x4 = 3
x3 = 4
x2 = 5
     1
     5
     4
     3
x4 = 6
x3 = 8
x2 = 10
     2
```

```
    10
     8
     6
```

```
syms x y z
a=[-1 3 2;1 2 -3;2 1 -2]
```

```
a = 3�3
   -1     3     2
    1     2    -3
    2     1    -2
```

```
X=[x;y;z]
```

X =

$$\begin{pmatrix} x \\ y \\ z \end{pmatrix}$$

```
b=[1;-9;-3]
```

```
b = 3�1
    1
   -9
   -3
```

```
c=inv(a)
```

```
c = 3�3
    0.0588   -0.4706    0.7647
    0.2353    0.1176    0.0588
    0.1765   -0.4118    0.2941
```

```
p=c*b
```

```
p = 3�1
    2.0000
   -1.0000
    3.0000
```

```
X=p
```

```
X = 3�1
    2.0000
   -1.0000
    3.0000
```

```
%Valiveti Manikanta Bhuvanesh
%19bcd7088
%Lab 3
syms x1 x2 x3
x1=45
```

```
x1 = 45
```

```
x3=35-x1
```

```
x3 = -10
```

```
x2=30-x3
```

```
x2 = 40
```

```
A=[1 0 0;0 1 1;1 0 1;0 1 0]
```

```
A = 4�3
     1     0     0
     0     1     1
     1     0     1
     0     1     0
```

```
B=[45;30;35;40]
```

```
B = 4�1
    45
    30
    35
    40
```

```
C=linsolve(A,B)
```

```
C = 3�1
   45.0000
   40.0000
  -10.0000
```

```
%Valiveti Manikanta Bhuvanesh
%19bcd7088
%Lab 4
syms x y z
eqn=[x+z+30==0,x-y+35==0,y-45==0,z+40==0]
```

eqn = $\left(x+z+30=0 \quad x-y+35=0 \quad y-45=0 \quad z+40=0\right)$

```
[x,y,z]=solve(eqn,[x,y,z])
```

x = 10
y = 45
z = -40

```
syms a b c d x
eqn=[c+d==700,a+d==700,a+b==1000,c+b==x+400]
```

eqn = $\left(c+d=700 \quad a+d=700 \quad a+b=1000 \quad b+c=x+400\right)$

```
[a,b,c,d,x]=solve(eqn,[a,b,c,d,x])
```

a = 700
b = 300
c = 700
d = 0
x = 600

```
syms a b c
eqn=[3*b-2*c+3==0,5*a-4*c-10==0,a+b==c]
```

eqn = $\left(3\,b-2\,c+3=0 \quad 5\,a-4\,c-10=0 \quad a+b=c\right)$

```
[a,b,c]=solve(eqn,[a,b,c])
```

a =

$\frac{2}{7}$

b =

$-\frac{17}{7}$

c =

$-\frac{15}{7}$

```
%Valiveti Manikanta Bhuvanesh
%19bcd7088
%Lab 5
A=[3 0 -1;0 1 0;2 0 0]
```

```
A = 3×3

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

```
P=poly(A)
```

```
P = 1×4

     1    -4     5    -2
```

```
poly2str(P,'x')
```

```
ans = '   x^3 - 4 x^2 + 5 x - 2'
```

```
polyvalm(P,A)
```

```
ans = 3×3

     0     0     0
     0     0     0
     0     0     0
```

```
%Valiveti Manikanta Bhuvanesh
%19bcd7088
%Lab 6,7
clc
clear all
M='ILOVELINEARALGEBRA'
```

```
M = 'ILOVELINEARALGEBRA'
```

```
N=double(M)-65
```

```
N = 1�18
     8    11    14    21     4    11     8    13     4     0    17     0    11     6     4
```

```
M=N+7
```

```
M = 1�18
    15    18    21    28    11    18    15    20    11     7    24     7    18    13    11
```

```
L=mod(M,26)
```

```
L = 1�18
    15    18    21     2    11    18    15    20    11     7    24     7    18    13    11
```

```
encrypt_shift=char(L+65)
```

```
encrypt_shift = 'PSVCLSPULHYHSNLIYH'
```

```
L=L-7
```

```
L = 1�18
     8    11    14    -5     4    11     8    13     4     0    17     0    11     6     4
```

```
L=mod(L,26)
```

```
L = 1�18
     8    11    14    21     4    11     8    13     4     0    17     0    11     6     4
```

```
decrypt_shift=char(L+65)
```

```
decrypt_shift = 'ILOVELINEARALGEBRA'
```

```
N=reshape(N,3,[])
```

```
N = 3�6
     8    21     8     0    11     1
    11     4    13    17     6    17
    14    11     4     0     4     0
```

```
key=[-5 -6 -59;1 1 12;2 3 22]
```

```
key = 3�3
    -5    -6   -59
     1     1    12
     2     3    22
```

```
N=key*N
```

```
N = 3�6
  -932  -778  -354  -102  -327  -107
   187   157    69    17    65    18
   357   296   143    51   128    53
```

```
P=mod(N,26)
```

```
P = 3�6
     4     2    10     2    11    23
     5     1    17    17    13    18
    19    10    13    25    24     1
```

```
encrypt_cipher=char(P+65)
```

```
encrypt_cipher = 3�6 char array
    'ECKCLX'
    'FBRRNS'
    'TKNZYB'
```

```
N=reshape(N,1,[])
```

```
N = 1�18
  -932   187   357  -778   157   296  -354    69   143  -102    17    51  -327    65   128  -10
```

```
decrypt=inv(key)*P
```

```
decrypt = 3�6

10^3 �
    0.5280    0.2030    1.0740    1.1180    1.0510    1.1450
   -0.0670   -0.0220   -0.1690   -0.1650   -0.1500   -0.1910
   -0.0380   -0.0150   -0.0740   -0.0780   -0.0740   -0.0780
```

```
decrypt=int16(decrypt)
```

```
decrypt = 3�6 int16 matrix
     528     203    1074    1118    1051    1145
     -67     -22    -169    -165    -150    -191
     -38     -15     -74     -78     -74     -78
```

```
decrypt=mod(decrypt,26)
```

```
decrypt = 3�6 int16 matrix
    8   21    8    0   11    1
   11    4   13   17    6   17
   14   11    4    0    4    0
```

```
decrypt=char(decrypt+65)
```

```
decrypt = 3�6 char array
    'IVIALB'
    'LENRGR'
    'OLEAEA'
```

```
decrypt_cipher=reshape(decrypt,1,[])
```

```
decrypt_cipher = 'ILOVELINEARALGEBRA'
```

```
%Valiveti Manikanta Bhuvanesh
%19bcd7088
%Lab 8
clc
clear all
a=[0 1 0 0;1/3 0 0 1/2;1/3 0 0 1/2;1/3 0 1 0]
```

```
a = 4×4
         0    1.0000         0         0
    0.3333         0         0    0.5000
    0.3333         0         0    0.5000
    0.3333         0    1.0000         0
```

```
[V,D]=eig(a)
```

```
V = 4×4
   -0.4575   -0.8384    0.6229   -0.8018
   -0.4575    0.1772   -0.4913   -0.0000
   -0.4575    0.1772   -0.4913    0.2673
   -0.6100    0.4841    0.3596    0.5345
D = 4×4
    1.0000         0         0         0
         0   -0.2113         0         0
         0         0   -0.7887         0
         0         0         0   -0.0000
```

```
p=null(a-eye(4,4))
```

```
p = 4×1
    0.4575
    0.4575
    0.4575
    0.6100
```

```
Y=abs(p/norm(p))
```

```
Y = 4×1
    0.4575
    0.4575
    0.4575
    0.6100
```

```
clc
clear all
a=[0 1/3 0 0;1 0 1/2 1/2;0 1/3 0 1/2;0 1/3 1/2 0]
```

```
a = 4×4
         0    0.3333         0         0
    1.0000         0    0.5000    0.5000
         0    0.3333         0    0.5000
         0    0.3333    0.5000         0
```

```
[V,D]=eig(a)
```

```
V = 4×4
    0.3928    0.5880   -0.2357   -0.0000
   -0.8586    0.4034   -0.7071    0.0000
```

```
    0.2329   -0.4957   -0.4714   -0.7071
    0.2329   -0.4957   -0.4714    0.7071
D = 4×4
   -0.7287         0         0         0
         0    0.2287         0         0
         0         0    1.0000         0
         0         0         0   -0.5000
```

```
p=null(a-eye(4,4))
```

```
p = 4×1
    0.2357
    0.7071
    0.4714
    0.4714
```

```
Y=abs(p/norm(p))
```

```
Y = 4×1
    0.2357
    0.7071
    0.4714
    0.4714
```

```
%Valiveti Manikanta Bhuvanesh
%19bcd7088
%Lab 9
clc
clear all
syms x1 x2 x3 X1 X2 X3 t c1 c2 c3
A=[0 1 0;0 0 1;8 -14 7]
```

```
A = 3×3
     0     1     0
     0     0     1
     8   -14     7
```

```
x=[x1;x2;x3]
```

x =

$$\begin{pmatrix} x_1 \\ x_2 \\ x_3 \end{pmatrix}$$

```
X(t)=[X1;X2;X3]
```

X(t) =

$$\begin{pmatrix} X_1 \\ X_2 \\ X_3 \end{pmatrix}$$

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

```
V = 3×3
    0.5774    0.2182   -0.0605
    0.5774    0.4364   -0.2421
    0.5774    0.8729   -0.9684
D = 3×3
    1.0000         0         0
         0    2.0000         0
         0         0    4.0000
```

```
l1=D(1,1)
```

```
l1 = 1.0000
```

```
l2=D(2,2)
```

```
l2 = 2.0000
```

```
l3=D(3,3)
```

```
l3 = 4.0000
```

```
V1=V(:,1)
```

```
V1 = 3×1
    0.5774
    0.5774
```

```
    0.5774
```

```
V2=V(:,2)
```

```
V2 = 3×1
    0.2182
    0.4364
    0.8729
```

```
V3=V(:,3)
```

```
V3 = 3×1
   -0.0605
   -0.2421
   -0.9684
```

```
X1(t)=(c1*(exp(l1*t))*V1)
```

X1(t) =

$$\begin{pmatrix} \frac{\sqrt{3}\,c_1\,e^t}{3} \\ \frac{\sqrt{3}\,c_1\,e^t}{3} \\ \frac{\sqrt{3}\,c_1\,e^t}{3} \end{pmatrix}$$

```
X2(t)=(c2*(exp(l2*t))*V2)
```

X2(t) =

$$\begin{pmatrix} \frac{\sqrt{21}\,c_2\,e^{2t}}{21} \\ \frac{2\sqrt{21}\,c_2\,e^{2t}}{21} \\ \frac{4\sqrt{21}\,c_2\,e^{2t}}{21} \end{pmatrix}$$

```
X3(t)=(c3*(exp(l3*t))*V3)
```

X3(t) =

$$\begin{pmatrix} -\frac{\sqrt{273}\,c_3\,e^{4t}}{273} \\ -\frac{4\sqrt{273}\,c_3\,e^{4t}}{273} \\ -\frac{16\sqrt{273}\,c_3\,e^{4t}}{273} \end{pmatrix}$$

```
X=X1+X2+X3
```

X(t) =

$$\begin{pmatrix} \frac{\sqrt{21}\,c_2\,e^{2t}}{21} - \frac{\sqrt{273}\,c_3\,e^{4t}}{273} + \sigma_1 \\ \frac{2\sqrt{21}\,c_2\,e^{2t}}{21} - \frac{4\sqrt{273}\,c_3\,e^{4t}}{273} + \sigma_1 \\ \frac{4\sqrt{21}\,c_2\,e^{2t}}{21} - \frac{16\sqrt{273}\,c_3\,e^{4t}}{273} + \sigma_1 \end{pmatrix}$$

where

$$\sigma_1 = \frac{\sqrt{3}\,c_1\,e^t}{3}$$

```
clc
clear all
syms x1 x2 x3 X1 X2 X3 t c1 c2 c3
A1=[1 -1;2 4]
```

```
A1 = 2×2
     1    -1
     2     4
```

```
x=[x1;x2]
```

x =

$$\begin{pmatrix} x_1 \\ x_2 \end{pmatrix}$$

```
X=[X1;X2]
```

X =

$$\begin{pmatrix} X_1 \\ X_2 \end{pmatrix}$$

```
[V,D]=eig(A1)
```

```
V = 2×2
   -0.7071    0.4472
    0.7071   -0.8944
D = 2×2
     2     0
     0     3
```

```
l1=D(1,1)
```

```
l1 = 2
```

```
l2=D(2,2)
```

```
l2 = 3
```

```
V1=V(:,1)
```

```
V1 = 2×1
   -0.7071
    0.7071
```

```
V2=V(:,2)
```

```
V2 = 2×1
    0.4472
   -0.8944
```

```
X1(t)=(c1*(exp(l1*t))*V1)
```

X1(t) =

$$\begin{pmatrix} -\frac{\sqrt{2}\,c_1\,e^{2t}}{2} \\ \frac{\sqrt{2}\,c_1\,e^{2t}}{2} \end{pmatrix}$$

```
X2(t)=(c2*(exp(l2*t))*V2)
```

X2(t) =

$$\begin{pmatrix} \frac{\sqrt{5}\,c_2\,e^{3t}}{5} \\ -\frac{2\,\sqrt{5}\,c_2\,e^{3t}}{5} \end{pmatrix}$$

```
X=X1+X2
```

X(t) =

$$\begin{pmatrix} \frac{\sqrt{5}\,c_2\,e^{3t}}{5} - \frac{\sqrt{2}\,c_1\,e^{2t}}{2} \\ \frac{\sqrt{2}\,c_1\,e^{2t}}{2} - \frac{2\,\sqrt{5}\,c_2\,e^{3t}}{5} \end{pmatrix}$$

```
%Valiveti Manikanta Bhuvanesh
%19bcd7088
%Lab 10
clc
clear all
syms y1(t) y2(t) k
A=[-2*k k;k -2*k]
```

A =

$$\begin{pmatrix} -2\,k & k \\ k & -2\,k \end{pmatrix}$$

```
Dy1=diff(diff(y1))
```

Dy1(t) =

$$\frac{\partial^2}{\partial t^2}\,y_1(t)$$

```
Dy2=diff(diff(y2))
```

Dy2(t) =

$$\frac{\partial^2}{\partial t^2}\,y_2(t)$$

```
[P lambda] = eig(A)
```

P =

$$\begin{pmatrix} 1 & -1 \\ 1 & 1 \end{pmatrix}$$

lambda =

$$\begin{pmatrix} -k & 0 \\ 0 & -3\,k \end{pmatrix}$$

```
if (rank(P)~=length(P))
fprintf('The matrix is not diagonlizable, thus solution is not possible using this method \n')
return
end
D = inv(P)*A*P
```

D =

$$\begin{pmatrix} -k & 0 \\ 0 & -3\,k \end{pmatrix}$$

```
Y = [y1(t);y2(t)]
```

Y =

$$\begin{pmatrix} y_1(t) \\ y_2(t) \end{pmatrix}$$

```
for i=1:length(A)
eqs=diff(diff(Y(i),t,1),t,1) - D(i,i)*Y(i) == 0
Sol(i)= dsolve(eqs)
end
```

eqs =

$$\frac{\partial^2}{\partial t^2}\,y_1(t) + k\,y_1(t) = 0$$

Sol = $C_3\,e^{\sqrt{-k}\,t} + C_4\,e^{-\sqrt{-k}\,t}$

eqs =

$$\frac{\partial^2}{\partial t^2} y_2(t) + 3\,k\,y_2(t) = 0$$

Sol = $\left(C_3\,e^{\sqrt{-k}\,t} + C_4\,e^{-\sqrt{-k}\,t} \quad C_5\,e^{\sqrt{3}\,\sqrt{-k}\,t} + C_6\,e^{-\sqrt{3}\,\sqrt{-k}\,t}\right)$

```
disp(Sol)
```

$$\left(C_3\,e^{\sqrt{-k}\,t} + C_4\,e^{-\sqrt{-k}\,t} \quad C_5\,e^{\sqrt{3}\,\sqrt{-k}\,t} + C_6\,e^{-\sqrt{3}\,\sqrt{-k}\,t}\right)$$

```
clc
clear all
syms y1(t) y2(t) k G(t) u
Dy1=diff(diff(y1))
```

Dy1(t) =

$$\frac{\partial^2}{\partial t^2} y_1(t)$$

```
Dy2=diff(diff(y2))
```

Dy2(t) =

$$\frac{\partial^2}{\partial t^2} y_2(t)$$

```
A=[0 -1;-1 0]
```

```
A = 2×2
     0    -1
    -1     0
```

```
G(t)=[-101*sin(10*t);101*sin(10*t)]
```

G(t) =

$$\begin{pmatrix} -101\,\sin(10\,t) \\ 101\,\sin(10\,t) \end{pmatrix}$$

```
%cond10=y1(0)==0
%cond11=Dy1(0)==6
%cond20=y2(0)==8
%cond21=Dy2(0)==6
%cond=[cond10;cond20]
[P lambda] = eig(A)
```

```
P = 2×2
   -0.7071   -0.7071
   -0.7071    0.7071

lambda = 2×2
    -1     0
     0     1
```

```
if (rank(P)~=length(P))
fprintf('The matrix is not diagonlizable, thus solution is not possible using this method \n')
return
end
D = inv(P)*A*P
```

```
D = 2×2
    -1     0
     0     1
```

```
Y = [y1(t);y2(t)]
```

Y =

$$\begin{pmatrix} y_1(t) \\ y_2(t) \end{pmatrix}$$

```
eqs=inv(P)*(diff(diff(Y,t,1),t,1) - D*inv(P)*Y -inv(P)*G(t) == 0)
```

eqs =

$$\begin{pmatrix} \sigma_2 + \sigma_1 = 0 \\ \sigma_2 - \sigma_1 = 0 \end{pmatrix}$$

where

$$\sigma_1 = \frac{\sqrt{2}\left(-\frac{\partial^2}{\partial t^2} y_2(t) + 101\sqrt{2}\sin(10\,t) - \frac{\sqrt{2}\,y_1(t)}{2} + \frac{\sqrt{2}\,y_2(t)}{2}\right)}{2}$$

$$\sigma_2 = \frac{\sqrt{2}\left(-\frac{\partial^2}{\partial t^2} y_1(t) + \frac{\sqrt{2}\,y_1(t)}{2} + \frac{\sqrt{2}\,y_2(t)}{2}\right)}{2}$$

```
u==inv(P)*Y
```

ans =

$$\begin{pmatrix} u = -\frac{\sqrt{2}\,y_1(t)}{2} - \frac{\sqrt{2}\,y_2(t)}{2} \\ u = \frac{\sqrt{2}\,y_2(t)}{2} - \frac{\sqrt{2}\,y_1(t)}{2} \end{pmatrix}$$

```
l=inv(P)*G(t)
```

l =

$$\begin{pmatrix} 0 \\ 101\sqrt{2}\sin(10\,t) \end{pmatrix}$$

```
for i=1:length(A)
    eqs1=diff(diff(u(i),t,1),t,1) -D(i,i)*u(i)==0
    Sol(i)= dsolve(eqs1)
    pi(i)=l(i)/(-100-D(i,i))
    u(i)=Sol(i)+pi(i)
end
```

eqs1 = $u = 0$

```
Error using mupadengine/feval (line 195)
No differential equations found. Specify differential equations by using symbolic functions.

Error in dsolve>mupadDsolve (line 340)
T = feval(symengine,'symobj::dsolve',sys,x,options);

Error in dsolve (line 194)
sol = mupadDsolve(args, options);
```

```
Y=P*u
```

```
%Valiveti manikanta bhuvanesh
%19BCD7088
%Solve the DE
% x'(t)=x1-x2
% x2'(t)=2x1+4x2
 clc
clear all
syms x1(t) x2(t)
a=diff(x1)==x1-x2;
b=diff(x2)==2*x1+4*x2;
c=[a;b];
[x1(t),x2(t)]=dsolve(c)
```

x1(t) =

$$-C_1 e^{2t} - \frac{C_2 e^{3t}}{2}$$

x2(t) = $C_1 e^{2t} + C_2 e^{3t}$

```
clc
clear all
syms x1(t) x2(t) x3(t)
a=diff(x1)==x2
```

a(t) =

$$\frac{\partial}{\partial t} x_1(t) = x_2(t)$$

```
b=diff(x2)==x3
```

b(t) =

$$\frac{\partial}{\partial t} x_2(t) = x_3(t)$$

```
c=diff(x3)==8*x1-14*x2+7*x3
```

c(t) =

$$\frac{\partial}{\partial t} x_3(t) = 8\,x_1(t) - 14\,x_2(t) + 7\,x_3(t)$$

```
S=[a;b;c];
cond=x1(0)==4;
cond1=x2(0)==6;
cond2=x3(0)==8;
[x1(t) x2(t) x3(t)]=dsolve(S,cond,cond1,cond2)
```

x1(t) =

$$3\,e^{2t} - \frac{e^{4t}}{3} + \frac{4\,e^{t}}{3}$$

x2(t) =

$$6\,e^{2t} - \frac{4\,e^{4t}}{3} + \frac{4\,e^{t}}{3}$$

x3(t) =

$$12\,e^{2t} - \frac{16\,e^{4t}}{3} + \frac{4\,e^{t}}{3}$$

```
%Valiveti manikanta bhuvanesh
%19BCD7088
%Program for finding rabbit population in n months
syms f(n) z F
eq = f(n+2) - f(n+1) - f(n)
```

eq = $f(n+2) - f(n+1) - f(n)$

```
Zt = ztrans(eq,n,z)
```

Zt = $z\,f(0) - z\,\mathrm{ztrans}(f(n),n,z) - z\,f(1) + z^2\,\mathrm{ztrans}(f(n),n,z) - z^2\,f(0) - \mathrm{ztrans}(f(n),n,z)$

```
Zt = subs(Zt,ztrans(f(n),n,z),F)
```

Zt = $z\,f(0) - F\,z - F - z\,f(1) + F\,z^2 - z^2\,f(0)$

```
F = solve(Zt,F)
```

F =

$$-\frac{z\,f(1) - z\,f(0) + z^2\,f(0)}{-z^2 + z + 1}$$

```
pSol = iztrans(F,z,n);
pSol = simplify(pSol)
```

pSol =

$$2\,(-1)^{n/2}\cos\left(n\,\left(\frac{\pi}{2} + \mathrm{asinh}\left(\frac{1}{2}\right)\,\mathrm{i}\right)\right)\,f(1) + \frac{2^{2-n}\,\sqrt{5}\,\left(\sqrt{5}+1\right)^{n-1}\,\sigma_1}{5} - \frac{2\,2^{1-n}\,\sqrt{5}\,\left(1-\sqrt{5}\right)^{n-1}\,\sigma_1}{5}$$

where

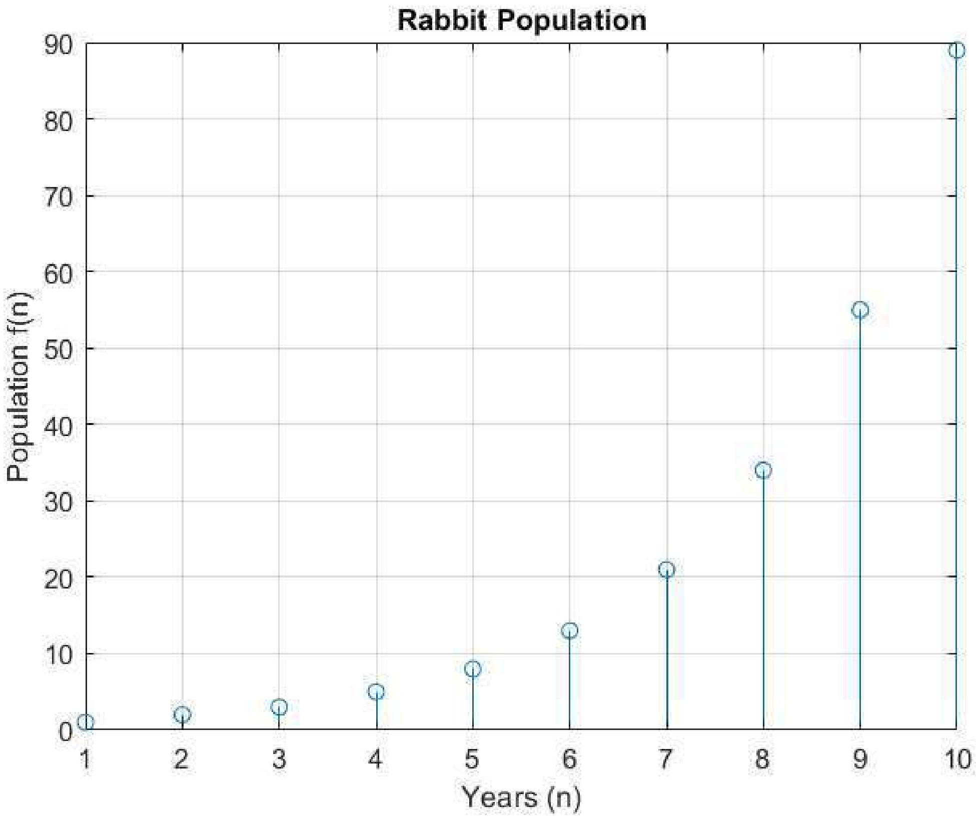
$$\sigma_1 = \frac{f(0)}{2} - f(1)$$

```
pSol = subs(pSol,[f(0) f(1)],[1 1])
```

pSol =

$$2\,(-1)^{n/2}\cos\left(n\,\left(\frac{\pi}{2} + \mathrm{asinh}\left(\frac{1}{2}\right)\,\mathrm{i}\right)\right) - \frac{2^{2-n}\,\sqrt{5}\,\left(\sqrt{5}+1\right)^{n-1}}{10} + \frac{2^{1-n}\,\sqrt{5}\,\left(1-\sqrt{5}\right)^{n-1}}{5}$$

```
nvalues = 1:10;
pSolValues = subs(pSol,n,nvalues);
pSolValues = double(pSolValues);
pSolValues = real(pSolValues);
stem(nvalues,pSolValues)
title('Rabbit Population')
xlabel('Years (n)')
ylabel('Population f(n)')
grid on
```



Rabbit Population
Population f(n)
Years (n)
0
10
20
30
40
50
60
70
80
90
1
2
3
4
5
6
7
8
9
10

```
%Valiveti manikanta bhuvanesh
%19BCD7088
%seriessoln
clc
clear all
syms x n
n=50
```

n = 50

```
a = sym('a',[1 n+1])
```

a =

$$\begin{pmatrix} a_1 & a_2 & a_3 & a_4 & a_5 & a_6 & a_7 & a_8 & a_9 & a_{10} & a_{11} & a_{12} & a_{13} & a_{14} & a_{15} & a_{16} & a_{17} & a_{18} & a_{19} & a_{20} & a_{21} & a_{22} & a_2 \end{pmatrix}$$

```
y = sum(a.*(x).^[0:n])
```

y =

$$a_{51}\,x^{50} + a_{50}\,x^{49} + a_{49}\,x^{48} + a_{48}\,x^{47} + a_{47}\,x^{46} + a_{46}\,x^{45} + a_{45}\,x^{44} + a_{44}\,x^{43} + a_{43}\,x^{42} + a_{42}\,x^{41} + a_{41}\,x^{40} + a_{40}$$

```
dy = diff(y);
d2y = diff(dy);
ode = collect(d2y-4*y,x)
```

ode =

$$(-4\,a_{51})\,x^{50} + (-4\,a_{50})\,x^{49} + (2450\,a_{51} - 4\,a_{49})\,x^{48} + (2352\,a_{50} - 4\,a_{48})\,x^{47} + (2256\,a_{49} - 4\,a_{47})\,x^{46} + (2$$

```
coef=coeffs(ode,x)
```

coef =

$$\begin{pmatrix} 2\,a_3 - 4\,a_1 & 6\,a_4 - 4\,a_2 & 12\,a_5 - 4\,a_3 & 20\,a_6 - 4\,a_4 & 30\,a_7 - 4\,a_5 & 42\,a_8 - 4\,a_6 & 56\,a_9 - 4\,a_7 & 72\,a_{10} - \end{pmatrix}$$

```
eq1=a(1)==0;
eq2=a(2)==1;
a=solve([eq1, eq2,coef(1:n-1)],a)
```

```
a = struct with fields:
      a1: [1�1 sym]
      a2: [1�1 sym]
      a3: [1�1 sym]
      a4: [1�1 sym]
      a5: [1�1 sym]
      a6: [1�1 sym]
      a7: [1�1 sym]
      a8: [1�1 sym]
      a9: [1�1 sym]
     a10: [1�1 sym]
     a11: [1�1 sym]
     a12: [1�1 sym]
     a13: [1�1 sym]
     a14: [1�1 sym]
```

```
soln=subs(y,a)
```

soln =

$$\frac{4\,x^{49}}{864420519568323528676859500764770952070467734375} + \frac{16\,x^{47}}{5880411697743697473992241501801l}$$

```
% Solution using dsolve command
syms z(t)
dz = diff(z,t); % First order derivative
d2z = diff(dz,t); % Second order derivative
ode1 = d2z-4*z % given ode in series form
```

ode1(t) =

$$\frac{\partial^2}{\partial t^2} z(t) - 4\, z(t)$$

```
ic1=z(0)==0
```

ic1 = $z(0) = 0$

```
ic2=dz(0)==1
```

ic2 =

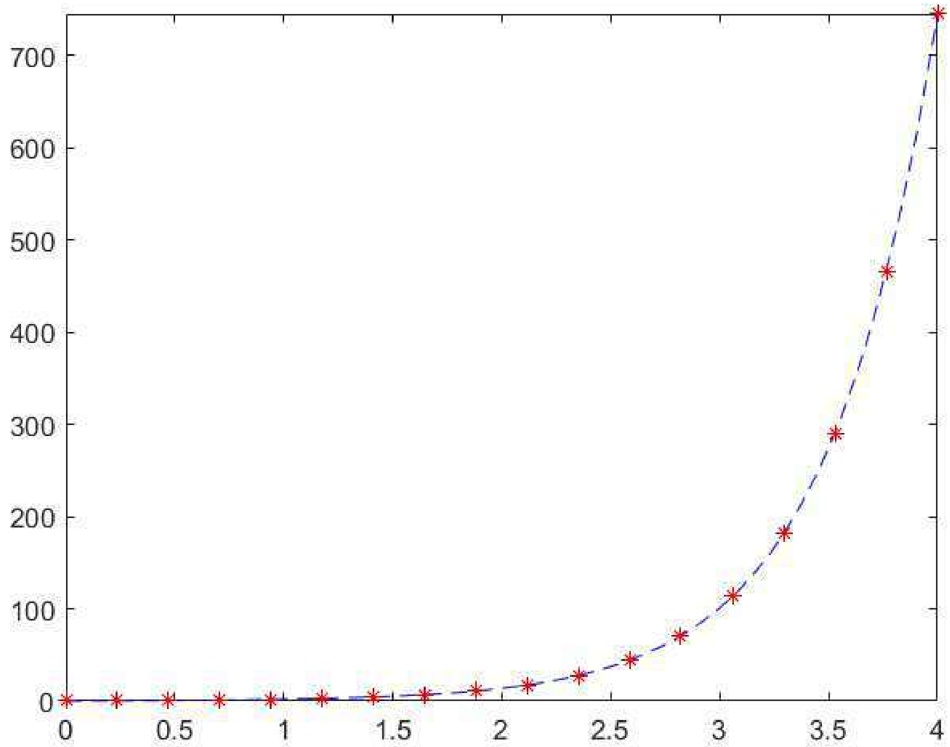
$$\left(\left(\frac{\partial}{\partial t} z(t)\right)\Big|_{t=0}\right) = 1$$

```
sol1=(dsolve(ode1,[ic1 ic2]))
```

sol1 =

$$\frac{e^{-2t}\,(e^{4t} - 1)}{4}$$

```
% J0=besselj(1,1)
% Y0=bessely(1,1)
% J1=besselj(1,5)
% Y1=bessely(1,5)
% Comparison of exact and series solutions
% soln=subs(sol1)
fplot(soln,[0 4],'--b')
hold on
fplot(sol1,[0 4],'*r')
```

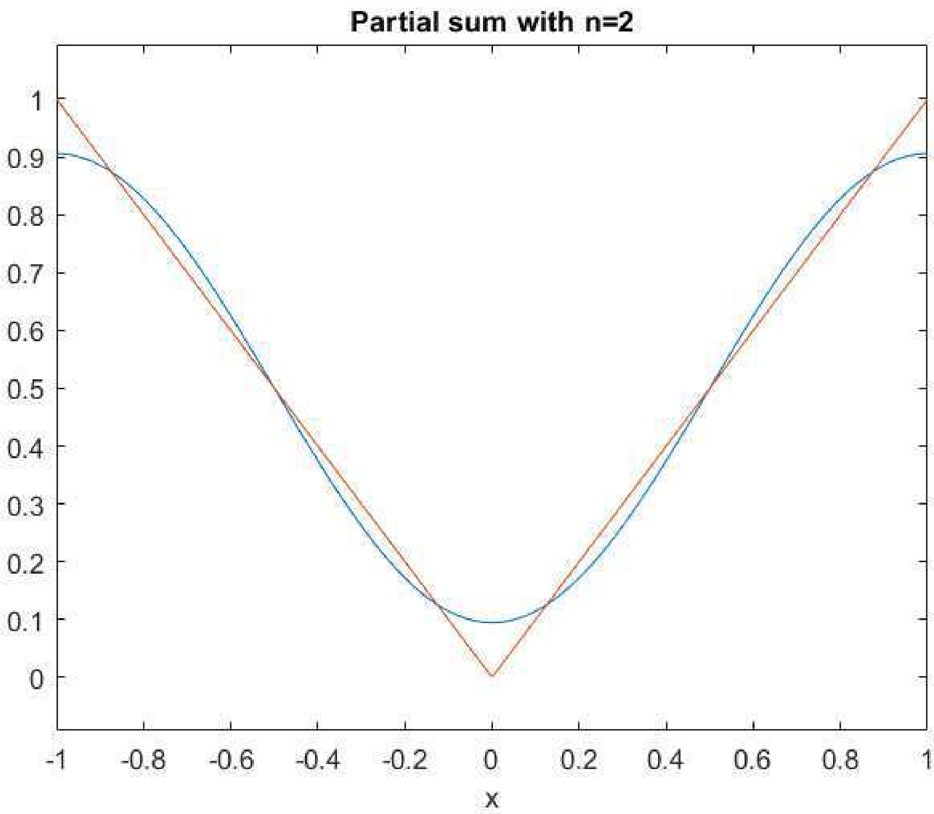



```
% hold on
% fplot(soln(3))
% hold on
% fplot(soln(4))



% xSol = sol.a0
% ySol = sol.a1
% zSol = sol.a2
% a3Sol = sol.a3
% p=taylor(exp(x), x, 1)
```

```
%Valiveti manikanta bhuvanesh
%19BCD7088
%fourierseries
clc
clear all
close all
syms x k L n
% evalin(symengine,'assume(k,Type::Integer)');
a= @(f,x,k,L) int(f*cos(k*pi*x/L)/L,x,-L,L);
b = @(f,x,k,L) int(f*sin(k*pi*x/L)/L,x,-L,L);
fs = @(f,x,n,L) a(f,x,0,L)/2 + ...
symsum(a(f,x,k,L)*cos(k*pi*x/L) + b(f,x,k,L)*sin(k*pi*x/L),k,1,n);
f=abs(x)
```

f = $|x|$

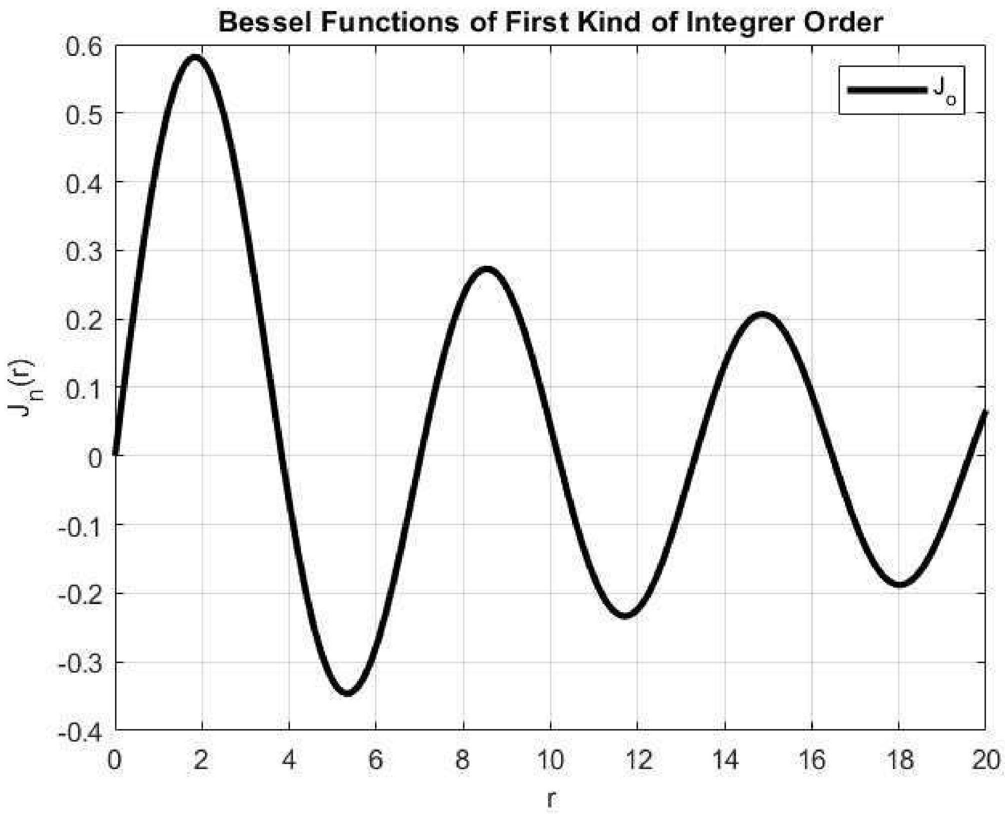
```
% pretty(fs(f,x,10,1))

ezplot(fs(f,x,2,1),-1,1)
hold on
ezplot(f,-1,1)
hold off
title('Partial sum with n=2')
```



```
%Valiveti manikanta bhuvanesh
%19BCD7088
%Bessel1st
clc;
clear all;
clf;
r=0:0.1:20;
% J=zeros(10,1)
J0=besselj(1,r);
J1=besselj(1,r);
J2=besselj(2,r);
figure(1)
plot(r,J0,'k','linewidth',2.5);
%hold on
% plot(r,J1,'b','linewidth',2.5);
% plot(r,J2,'r','linewidth',2.5)
 grid on
 legend('J_o','J_1','J_2')
```

```
Warning: Ignoring extra legend entries.
```

```
 xlabel('r');ylabel('J_n(r)')
title('Bessel Functions of First Kind of Integrer Order')
```



```
%Valiveti manikanta bhuvanesh
%19BCD7088
%secondorder_difference_eqn
clc
clear all
syms y(n) r
p=  2%input('Enter the coefficient of y(n+1): ')
```

p = 2

```
q= 4;
eqn=y(n+2)-p*y(n+1)-q*y(n)==0;
display('The given Difference equation is :')
```

The given Difference equation is :

```
display(eqn)
```

eqn = $y(n+2) - 2\,y(n+1) - 4\,y(n) = 0$

```
AE=r^2-p*r-q
```

AE = $r^2 - 2\,r - 4$

```
r=solve(AE)
```

r =

$$\begin{pmatrix} 1-\sqrt{5} \\ \sqrt{5}+1 \end{pmatrix}$$

```
% if imag(r(1))~=0
```

```
%Valiveti manikanta bhuvanesh
%19BCD7088
%quetion 3
syms y(n) z yZT
assume(n>=0 & in(n,'integer'))
f=y(n+2)-(3*(y(n+1)))+2*y(n)-(3^n)
```

f = $y(n+2) - 3\,y(n+1) + 2\,y(n) - 3^n$

```
fZT=ztrans(f,n,z)
```

fZT =

$$3\,z\,y(0) - 3\,z\,\mathrm{ztrans}(y(n),n,z) - \frac{z}{z-3} - z\,y(1) + z^2\,\mathrm{ztrans}(y(n),n,z) - z^2\,y(0) + 2\,\mathrm{ztrans}(y(n),n,z)$$

```
fZT=subs(fZT,ztrans(y(n),n,z),yZT)
```

fZT =

$$2\,\mathrm{yZT} - \frac{z}{z-3} + 3\,z\,y(0) - z\,y(1) - 3\,\mathrm{yZT}\,z - z^2\,y(0) + \mathrm{yZT}\,z^2$$

```
yZT=solve(fZT,yZT)
```

yZT =

$$\frac{\frac{z}{z-3} - 3\,z\,y(0) + z\,y(1) + z^2\,y(0)}{z^2 - 3\,z + 2}$$

```
ysol=iztrans(yZT,z,n)
```

ysol =

$$y(0)\,\delta_{n,0} - (\delta_{n,0} - 1)\left(2\,y(0) - y(1) + \frac{1}{2}\right) - \left(\frac{2^n}{2} - \frac{\delta_{n,0}}{2}\right)(2\,y(0) - 2\,y(1) + 2) + \frac{3^n}{2} - \frac{\delta_{n,0}}{2}$$

```
ysol=simplify(ysol)
```

ysol =

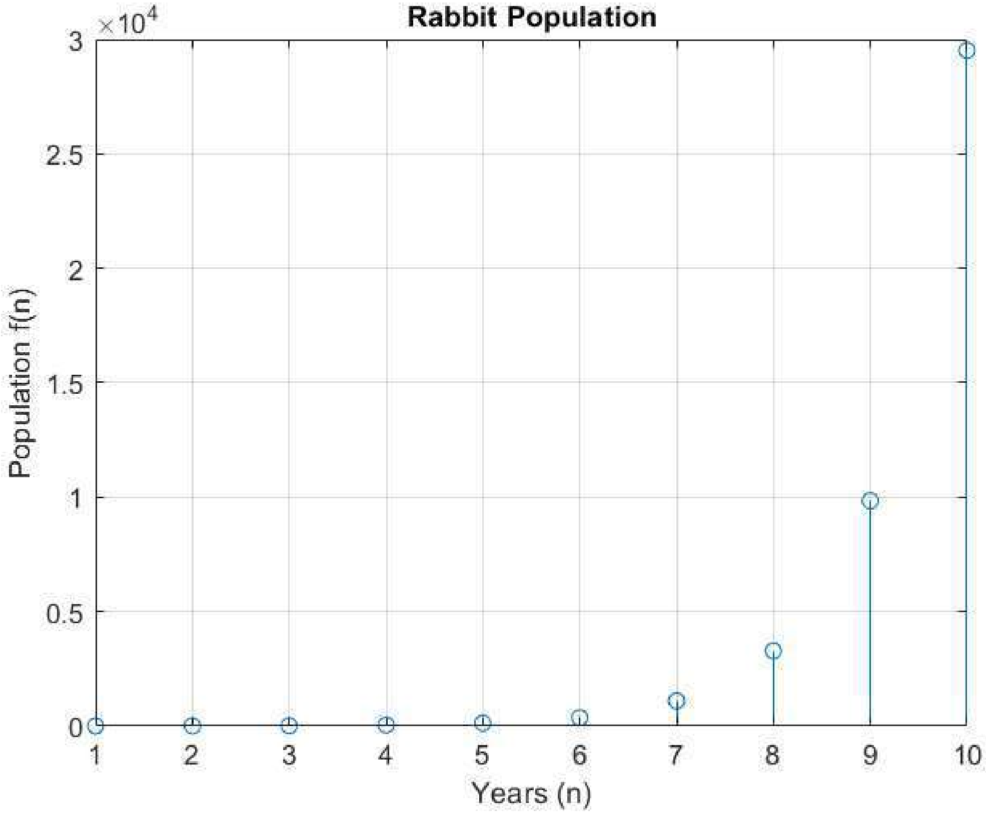
$$2\,y(0) - y(1) - 2^n\,y(0) + 2^n\,y(1) - 2^n + \frac{3^n}{2} + \frac{1}{2}$$

```
ysol=subs(ysol,[y(0) y(1)],[0 1])
```

ysol =

$$\frac{3^n}{2} - \frac{1}{2}$$

```
nvalues = 1:10;
ySolValues = subs(ysol,n,nvalues);
ySolValues = double(ySolValues);
ySolValues = real(ySolValues);
stem(nvalues,ySolValues)
title('Rabbit Population')
xlabel('Years (n)')
ylabel('Population f(n)')
grid on
```


Rabbit Population
×10^4
3
2.5
2
1.5
1
0.5
0
Population f(n)
1
2
3
4
5
6
7
8
9
10
Years (n)

```
%Valiveti manikanta bhuvanesh
%19BCD7088
%quetion 4
syms y(n) z yZT
assume(n>=0 & in(n,'integer'))
f=y(n+2)-(4*(y(n+1)))+4*y(n)-(3*n)-2^n
```

f = $y(n+2) - 4\,y(n+1) - 3\,n + 4\,y(n) - 2^n$

```
fZT=ztrans(f,n,z)
```

fZT =

$$4\,z\,y(0) - \frac{z}{z-2} - 4\,z\,\mathrm{ztrans}(y(n),n,z) - \frac{3\,z}{(z-1)^2} - z\,y(1) + z^2\,\mathrm{ztrans}(y(n),n,z) - z^2\,y(0) + 4\,\mathrm{ztrans}(y(r$$

```
fZT=subs(fZT,ztrans(y(n),n,z),yZT)
```

fZT =

$$4\,\mathrm{yZT} - \frac{3\,z}{(z-1)^2} - \frac{z}{z-2} + 4\,z\,y(0) - z\,y(1) - 4\,\mathrm{yZT}\,z - z^2\,y(0) + \mathrm{yZT}\,z^2$$

```
yZT=solve(fZT,yZT)
```

yZT =

$$\frac{\frac{3\,z}{(z-1)^2} + \frac{z}{z-2} - 4\,z\,y(0) + z\,y(1) + z^2\,y(0)}{z^2 - 4\,z + 4}$$

```
ysol=iztrans(yZT,z,n)
```

ysol =

$$3\,n + \left(\frac{\delta_{n,0}}{4} + \frac{2^n\,(n-1)}{4}\right)\,(2\,y(1) - 4\,y(0) + 7) + \frac{2^n\,\binom{n-1}{2}}{4} + y(0)\,\delta_{n,0} - \frac{25\,\delta_{n,0}}{4} + \left(\frac{2^n}{2} - \frac{\delta_{n,0}}{2}\right)\,(y(1)\,\cdot$$

```
ysol=simplify(ysol)
```

ysol =

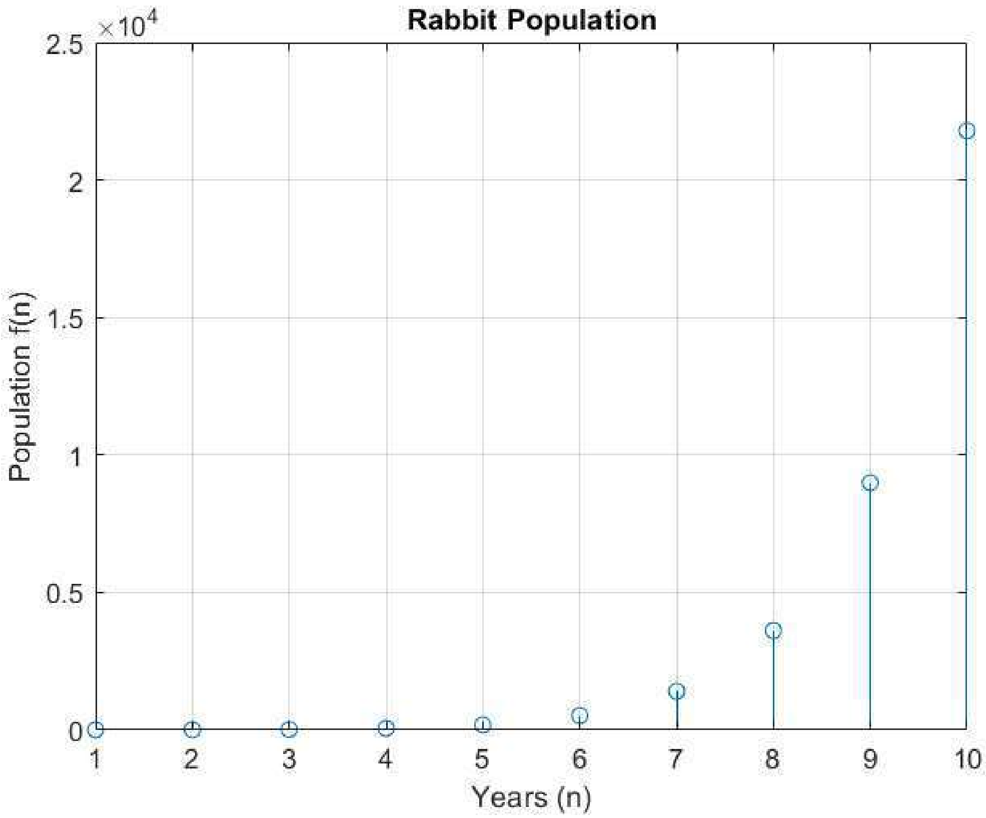
$$3\,n + \frac{2^n\,\binom{n-1}{2}}{4} + \frac{7\,2^n\,n}{4} + 2^n\,y(0) - \frac{25\,2^n}{4} - 2^n\,n\,y(0) + \frac{2^n\,n\,y(1)}{2} + 6$$

```
ysol=subs(ysol,[y(0) y(1)],[1 2])
```

ysol =

$$3\,n + \frac{2^n\,\binom{n-1}{2}}{4} + \frac{7\,2^n\,n}{4} - \frac{21\,2^n}{4} + 6$$

```
nvalues = 1:10;
ySolValues = subs(ysol,n,nvalues);
ySolValues = double(ySolValues);
ySolValues = real(ySolValues);
stem(nvalues,ySolValues)
title('Rabbit Population')
xlabel('Years (n)')
ylabel('Population f(n)')
grid on
```


Rabbit Population
$\times 10^4$
2.5
2
1.5
1
0.5
0
Population f(n)
1
2
3
4
5
6
7
8
9
10
Years (n)

```
%Valiveti manikanta bhuvanesh
%19BCD7088
%quetion 5
syms y(n) z
assume(n>=0 & in(n,'integer'))
f=y(n)+((1/4)^n)*heaviside(n)
```

f =

$$y(n) + \left(\frac{1}{4}\right)^n \mathrm{heaviside}(n)$$

```
fZT=ztrans(f,n,z)
```

fZT =

$$\frac{1}{4\,z-1} + \mathrm{ztrans}(y(n), n, z) + \frac{1}{2}$$

```
fZT=subs(fZT,ztrans(y(n),n,z),yZT)
```

fZT =

$$z + \frac{1}{4\,z-1} + \frac{1}{2}$$

```
f=(2*z)/(z-1)
```

f =

$$\frac{2\,z}{z-1}$$

```
inverse=iztrans(f,z,n)
```

inverse = 2

```
%Valiveti manikanta bhuvanesh
%19BCD7088
%quetion 6
syms y(n) z yZT
assume(n>=0 & in(n,'integer'))
f=y(n+2)-(5*(y(n+1)))+6*y(n)-5^n
```

f = $y(n+2) - 5\,y(n+1) + 6\,y(n) - 5^n$

```
fZT=ztrans(f,n,z)
```

fZT =

$$5\,z\,y(0) - 5\,z\,\mathrm{ztrans}(y(n), n, z) - \frac{z}{z-5} - z\,y(1) + z^2\,\mathrm{ztrans}(y(n), n, z) - z^2\,y(0) + 6\,\mathrm{ztrans}(y(n), n, z)$$

```
fZT=subs(fZT,ztrans(y(n),n,z),yZT)
```

fZT =

$$6\,\mathrm{yZT} - \frac{z}{z-5} + 5\,z\,y(0) - z\,y(1) - 5\,\mathrm{yZT}\,z - z^2\,y(0) + \mathrm{yZT}\,z^2$$

```
yZT=solve(fZT,yZT)
```

yZT =

$$\frac{\frac{z}{z-5} - 5\,z\,y(0) + z\,y(1) + z^2\,y(0)}{z^2 - 5\,z + 6}$$

```
ysol=iztrans(yZT,z,n)
```

ysol =

$$\left(\frac{2^n}{2} - \frac{\delta_{n,0}}{2}\right)\left(6\,y(0) - 2\,y(1) + \frac{2}{3}\right) - \left(\frac{3^n}{3} - \frac{\delta_{n,0}}{3}\right)\left(6\,y(0) - 3\,y(1) + \frac{3}{2}\right) + y(0)\,\delta_{n,0} + \frac{5^n}{6} - \frac{\delta_{n,0}}{6}$$

```
ysol=simplify(ysol)
```

ysol =

$$3\,2^n\,y(0) - 2^n\,y(1) - 2\,3^n\,y(0) + 3^n\,y(1) + \frac{2^n}{3} - \frac{3^n}{2} + \frac{5^n}{6}$$

```
ysol=subs(ysol,[y(0) y(1)],[1 1])
```

ysol =

$$\frac{7\,2^n}{3} - \frac{3\,3^n}{2} + \frac{5^n}{6}$$

```
%Valiveti manikanta bhuvanesh
%19BCD7088
%quetion 1

syms x y
p=1
```

```
p = 1
```

```
q=p/2
```

```
q = 0.5000
```

```
x=0:1:5
```

```
x = 1�6
     0     1     2     3     4     5
```

```
y=[4,8,15,7,6,2]
```

```
y = 1�6
     4     8    15     7     6     2
```

```
k=6
```

```
k = 6
```

```
l=6
```

```
l = 6
```

```
a0=(2/k)*sum(y)
```

```
a0 = 14
```

```
for n=1:l
an=(2/k)*sum(y.*cos(n*pi*x/q))
bn=(2/k)*sum(y.*sin(n*pi*x/q))
end
```

```
an = 14
bn = -7.5928e-15
an = 14
bn = -1.5186e-14
an = 14
bn = -2.7515e-14
an = 14
bn = -3.0371e-14
an = 14
bn = -4.9806e-14
an = 14
bn = -5.5031e-14
```

```
for n=1:l
S=an*cos(n*pi*x/q)+bn*sin(n*pi*x/q);
end
HS=(a0/2)+sum(S)
```

```
HS = 91
```

```
%Valiveti manikanta bhuvanesh
%19BCD7088
%quetion 2

syms f(n) z p
assume(n>=0 & in(n,'integer'))
eq =f(n+2)-3*f(n+1)+2*f(n)==0
```

eq = $f(n+2) - 3\, f(n+1) + 2\, f(n) = 0$

```
Zt = ztrans(eq,n,z)
```

Zt =

$3\, z\, f(0) - 3\, z\, \mathrm{ztrans}(f(n), n, z) - z\, f(1) + z^2\, \mathrm{ztrans}(f(n), n, z) - z^2\, f(0) + 2\, \mathrm{ztrans}(f(n), n, z) = 0$

```
Zt = subs(Zt,ztrans(f(n),n,z),p)
```

Zt = $2\, p + 3\, z\, f(0) - z\, f(1) - 3\, p\, z - z^2\, f(0) + p\, z^2 = 0$

```
p = solve(Zt,p)
```

p =

$$\frac{z\, f(1) - 3\, z\, f(0) + z^2\, f(0)}{z^2 - 3\, z + 2}$$

```
pSol = iztrans(p,z,n);
pSol = simplify(pSol)
```

pSol = $2\, f(0) - f(1) - 2^n\, f(0) + 2^n\, f(1)$

```
pSol = subs(pSol,[f(0) f(1)],[200 220])
```

pSol = $20\, 2^n + 180$

```
%Valiveti manikanta bhuvanesh
%19BCD7088
%quetion 3
syms y(n) z yZT
assume(n>=0 & in(n,'integer'))
f=y(n+2)-(3*(y(n+1)))+2*y(n)-(3^n)
```

f = $y(n+2) - 3\,y(n+1) + 2\,y(n) - 3^n$

```
fZT=ztrans(f,n,z)
```

fZT =

$$3\,z\,y(0) - 3\,z\,\mathrm{ztrans}(y(n), n, z) - \frac{z}{z-3} - z\,y(1) + z^2\,\mathrm{ztrans}(y(n), n, z) - z^2\,y(0) + 2\,\mathrm{ztrans}(y(n), n, z)$$

```
fZT=subs(fZT,ztrans(y(n),n,z),yZT)
```

fZT =

$$2\,\mathrm{yZT} - \frac{z}{z-3} + 3\,z\,y(0) - z\,y(1) - 3\,\mathrm{yZT}\,z - z^2\,y(0) + \mathrm{yZT}\,z^2$$

```
yZT=solve(fZT,yZT)
```

yZT =

$$\frac{\frac{z}{z-3} - 3\,z\,y(0) + z\,y(1) + z^2\,y(0)}{z^2 - 3\,z + 2}$$

```
ysol=iztrans(yZT,z,n)
```

ysol =

$$y(0)\,\delta_{n,0} - (\delta_{n,0} - 1)\left(2\,y(0) - y(1) + \frac{1}{2}\right) - \left(\frac{2^n}{2} - \frac{\delta_{n,0}}{2}\right)(2\,y(0) - 2\,y(1) + 2) + \frac{3^n}{2} - \frac{\delta_{n,0}}{2}$$

```
ysol=simplify(ysol)
```

ysol =

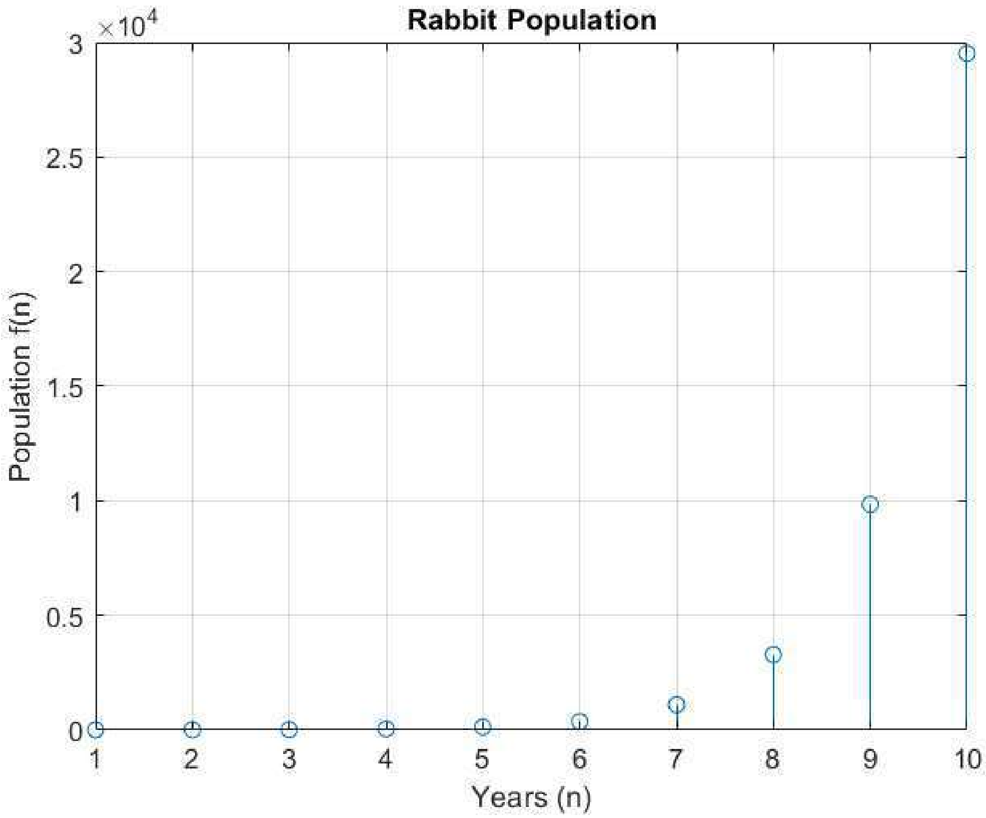
$$2\,y(0) - y(1) - 2^n\,y(0) + 2^n\,y(1) - 2^n + \frac{3^n}{2} + \frac{1}{2}$$

```
ysol=subs(ysol,[y(0) y(1)],[0 1])
```

ysol =

$$\frac{3^n}{2} - \frac{1}{2}$$

```
nvalues = 1:10;
ySolValues = subs(ysol,n,nvalues);
ySolValues = double(ySolValues);
ySolValues = real(ySolValues);
stem(nvalues,ySolValues)
title('Rabbit Population')
xlabel('Years (n)')
ylabel('Population f(n)')
grid on
```



Rabbit Population
$\times 10^4$
3
2.5
2
1.5
1
0.5
0
Population f(n)
1 2 3 4 5 6 7 8 9 10
Years (n)

```
%Valiveti manikanta bhuvanesh
%19BCD7088
%quetion 4
syms y(n) z yZT
assume(n>=0 & in(n,'integer'))
f=y(n+2)-(4*(y(n+1)))+4*y(n)-(3*n)-2^n
```

f = $y(n+2) - 4\,y(n+1) - 3\,n + 4\,y(n) - 2^n$

```
fZT=ztrans(f,n,z)
```

fZT =

$$4\,z\,y(0) - \frac{z}{z-2} - 4\,z\,\mathrm{ztrans}(y(n),n,z) - \frac{3\,z}{(z-1)^2} - z\,y(1) + z^2\,\mathrm{ztrans}(y(n),n,z) - z^2\,y(0) + 4\,\mathrm{ztrans}(y(n$$

```
fZT=subs(fZT,ztrans(y(n),n,z),yZT)
```

fZT =

$$4\,\mathrm{yZT} - \frac{3\,z}{(z-1)^2} - \frac{z}{z-2} + 4\,z\,y(0) - z\,y(1) - 4\,\mathrm{yZT}\,z - z^2\,y(0) + \mathrm{yZT}\,z^2$$

```
yZT=solve(fZT,yZT)
```

yZT =

$$\frac{\frac{3\,z}{(z-1)^2} + \frac{z}{z-2} - 4\,z\,y(0) + z\,y(1) + z^2\,y(0)}{z^2 - 4\,z + 4}$$

```
ysol=iztrans(yZT,z,n)
```

ysol =

$$3\,n + \left(\frac{\delta_{n,0}}{4} + \frac{2^n\,(n-1)}{4}\right)\,(2\,y(1) - 4\,y(0) + 7) + \frac{2^n\,\binom{n-1}{2}}{4} + y(0)\,\delta_{n,0} - \frac{25\,\delta_{n,0}}{4} + \left(\frac{2^n}{2} - \frac{\delta_{n,0}}{2}\right)\,(y(1)$$

```
ysol=simplify(ysol)
```

ysol =

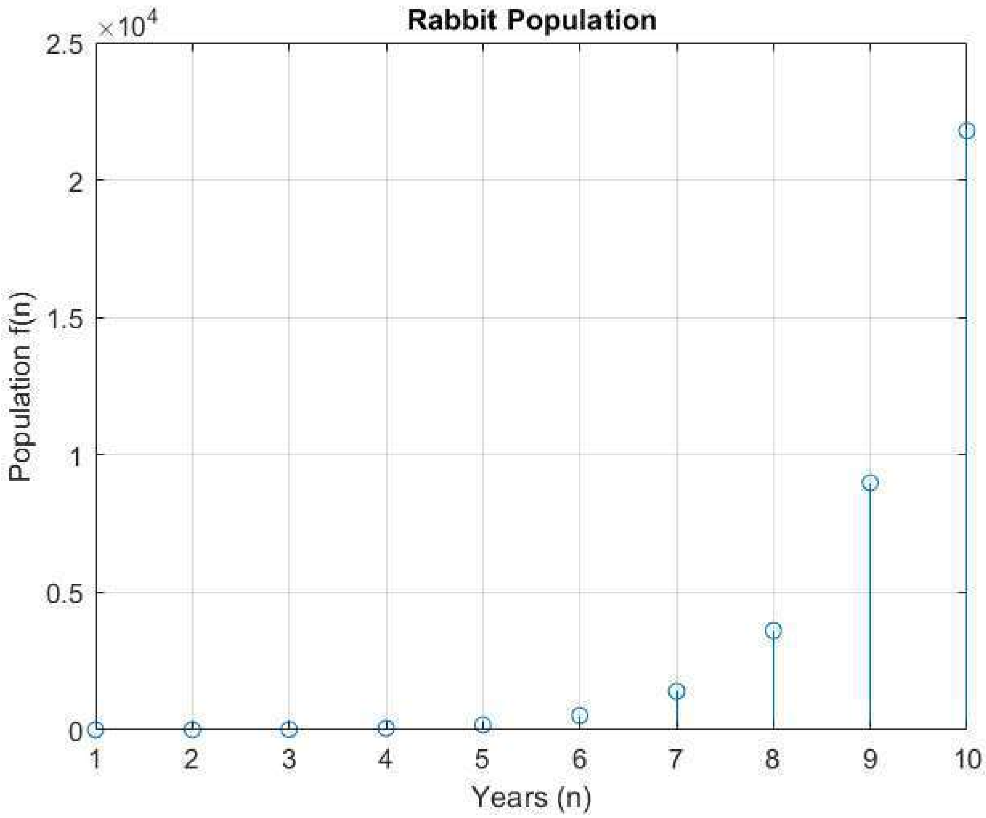
$$3\,n + \frac{2^n\,\binom{n-1}{2}}{4} + \frac{7\,2^n\,n}{4} + 2^n\,y(0) - \frac{25\,2^n}{4} - 2^n\,n\,y(0) + \frac{2^n\,n\,y(1)}{2} + 6$$

```
ysol=subs(ysol,[y(0) y(1)],[1 2])
```

ysol =

$$3\,n + \frac{2^n\,\binom{n-1}{2}}{4} + \frac{7\,2^n\,n}{4} - \frac{21\,2^n}{4} + 6$$

```
nvalues = 1:10;
ySolValues = subs(ysol,n,nvalues);
ySolValues = double(ySolValues);
ySolValues = real(ySolValues);
stem(nvalues,ySolValues)
title('Rabbit Population')
xlabel('Years (n)')
ylabel('Population f(n)')
grid on
```



Rabbit Population
×10^4
2.5
2
1.5
1
0.5
0
Population f(n)
1
2
3
4
5
6
7
8
9
10
Years (n)

```
%Valiveti manikanta bhuvanesh
%19BCD7088
%quetion 5
syms y(n) z
assume(n>=0 & in(n,'integer'))
f=y(n)+((1/4)^n)*heaviside(n)
```

f =

$$y(n) + \left(\frac{1}{4}\right)^n \mathrm{heaviside}(n)$$

```
fZT=ztrans(f,n,z)
```

fZT =

$$\frac{1}{4\,z-1} + \mathrm{ztrans}(y(n), n, z) + \frac{1}{2}$$

```
fZT=subs(fZT,ztrans(y(n),n,z),yZT)
```

fZT =

$$z + \frac{1}{4\,z-1} + \frac{1}{2}$$

```
f=(2*z)/(z-1)
```

f =

$$\frac{2\,z}{z-1}$$

```
inverse=iztrans(f,z,n)
```

inverse = 2

```
%Valiveti manikanta bhuvanesh
%19BCD7088
%quetion 6
syms y(n) z yZT
assume(n>=0 & in(n,'integer'))
f=y(n+2)-(5*(y(n+1)))+6*y(n)-5^n
```

f = $y(n+2) - 5\,y(n+1) + 6\,y(n) - 5^n$

```
fZT=ztrans(f,n,z)
```

fZT =

$$5\,z\,y(0) - 5\,z\,\mathrm{ztrans}(y(n), n, z) - \frac{z}{z-5} - z\,y(1) + z^2\,\mathrm{ztrans}(y(n), n, z) - z^2\,y(0) + 6\,\mathrm{ztrans}(y(n), n, z)$$

```
fZT=subs(fZT,ztrans(y(n),n,z),yZT)
```

fZT =

$$6\,\mathrm{yZT} - \frac{z}{z-5} + 5\,z\,y(0) - z\,y(1) - 5\,\mathrm{yZT}\,z - z^2\,y(0) + \mathrm{yZT}\,z^2$$

```
yZT=solve(fZT,yZT)
```

yZT =

$$\frac{\frac{z}{z-5} - 5\,z\,y(0) + z\,y(1) + z^2\,y(0)}{z^2 - 5\,z + 6}$$

```
ysol=iztrans(yZT,z,n)
```

ysol =

$$\left(\frac{2^n}{2} - \frac{\delta_{n,0}}{2}\right)\left(6\,y(0) - 2\,y(1) + \frac{2}{3}\right) - \left(\frac{3^n}{3} - \frac{\delta_{n,0}}{3}\right)\left(6\,y(0) - 3\,y(1) + \frac{3}{2}\right) + y(0)\,\delta_{n,0} + \frac{5^n}{6} - \frac{\delta_{n,0}}{6}$$

```
ysol=simplify(ysol)
```

ysol =

$$3\,2^n\,y(0) - 2^n\,y(1) - 2\,3^n\,y(0) + 3^n\,y(1) + \frac{2^n}{3} - \frac{3^n}{2} + \frac{5^n}{6}$$

```
ysol=subs(ysol,[y(0) y(1)],[1 1])
```

ysol =

$$\frac{7\,2^n}{3} - \frac{3\,3^n}{2} + \frac{5^n}{6}$$