```
>> A=[.2 .5;-.5 1.3]

A =

    0.2000    0.5000
   -0.5000    1.3000

>> X0=[20;5]

X0 =

    20
     5

>> X1=A*X0

X1 =

    6.5000
   -3.5000

>> X2=A^2*X0

X2 =

   -0.4500
   -7.8000

>> X2_alt=A*X1

X2_alt =

   -0.4500
   -7.8000

>> X3=A^3*X0

X3 =

   -3.9900
   -9.9150

>> X10=A^10*X0

X10 =

   -6.8810
  -10.7608
```

```
>> X4=A^4*X0

X4 =

   -5.7555
  -10.8945
>> X5=A^5*X0

X5 =

   -6.5983
  -11.2851

>> X6=A^6*X0

X6 =

   -6.9622
  -11.3715

>> X20=A^20*X0

X20 =

   -5.6064
   -8.7362

>> PM=[X0 X1 X2 X3 X4 X5 X6 X10 X20]

PM =

  Columns 1 through 7

   20.0000    6.5000   -0.4500   -3.9900   -5.7555   -6.5983   -6.9622
    5.0000   -3.5000   -7.8000   -9.9150  -10.8945  -11.2851  -11.3715

  Columns 8 through 9

   -6.8810   -5.6064
  -10.7608   -8.7362

>> plot(PM')

>> X=PM(1,:)

X =

  Columns 1 through 7
```

```
   20.0000    6.5000   -0.4500   -3.9900   -5.7555   -6.5983   -6.9622

  Columns 8 through 9

   -6.8810   -5.6064

>> Y=PM(2,:)

Y =

  Columns 1 through 7

    5.0000   -3.5000   -7.8000   -9.9150  -10.8945  -11.2851  -11.3715

  Columns 8 through 9

  -10.7608   -8.7362

>> plot(X,Y)

>> [xi,R]=eig(sym(A))

xi =

[ 21^(1/2)/10 + 11/10, 11/10 - 21^(1/2)/10]
[                   1,                   1]


R =

[ 3/4 - 21^(1/2)/20,                   0]
[                 0, 21^(1/2)/20 + 3/4]


>> x=linspace(-10,20,51);
>> y=1/(21^(1/2)/10 + 11/10)*x;
>> hold on
>> plot(x,y)
>> y1=1/(11/10 - 21^(1/2)/10)*x;
>> plot(x,y1)
>> hold off

>> plot(X,Y)
>> hold on
>> plot(x,y,'r')
>> plot(x,y1,'g')
>> hold off
```

```
>> B=[.56 .71;.44 .29]

B =

   0.5600    0.7100
   0.4400    0.2900

>> B^60

ans =

   0.6174    0.6174
   0.3826    0.3826

>>

>> syms x y x1 x2 t lambda L
>> A=[1 2; 6 5];
>> [xi,R]=eig(sym(A))

xi =

[ -1, 1/3]
[  1,   1]


R =

[ -1, 0]
[  0, 7]

>> A=[3 -4;1 -1];
>> [xi,R]=eig(sym(A))

xi =

 2
 1


R =

[ 1, 0]
[ 0, 1]

>> M=[2 -4; 1 -2];
>> eta=M\xi
Warning: System is rank deficient. Solution is not unique.
```

```
eta =

 1
 0

>>[x1,x2]=dsolve('Dx1=x2','Dx2=-x1','t')

x1 =

C2*cos(t) + C1*sin(t)


x2 =

C1*cos(t) - C2*sin(t)

>>[x1,x2]=dsolve('Dx1=x2','Dx2=-x1','x1(0)=1','x2(0)=3','t')

x1 =

cos(t) + 3*sin(t)


x2 =

3*cos(t) - sin(t)

>> ivp='Dx=-3*x+2*y,Dy=-x,x(0)=1,y(0)=0';
>> [x,y]=dsolve(ivp,'t');
>> xf=@(t) eval(vectorize(x));
>> yf=@(t) eval(vectorize(y));
>> t=-0.3:0.1:5;
>> plot(xf(t),yf(t))
>> xlabel 'x'
>> ylabel 'y'
>>syms a b
>> ivp='Dx=x-2*y,Dy=-x,x(0)=a,y(0)=b';
>> [x,y]=dsolve(ivp,'t');
>> xf=@(t,a,b) eval(vectorize(x));
>> yf=@(t,a,b) eval(vectorize(y));
>> figure; hold on
>> t=-3:0.1:3;
>> for a=-2:2
for b=-2:2
plot(xf(t,a,b),yf(t,a,b))
end
end
```

```
>> hold off
>> axis([-20 20 -15 15])
>> xlabel 'x'
>> ylabel 'y'
>> ivp='Dx=x+2*y, Dy=-x,x(0)=a,y(0)=0';
>> [x,y]=dsolve(ivp,'t');
>> xf=@(t,a) eval(vectorize(x));
>> yf=@(t,a) eval(vectorize(y));
>> figure; hold on
>> t=-10:0.1:10;
>> for a=-4:4
plot(xf(t,a),yf(t,a))
end
>> hold off
>> axis([-15 15 -10 10])
>> xlabel 'x'
>> ylabel 'y'
>>
```