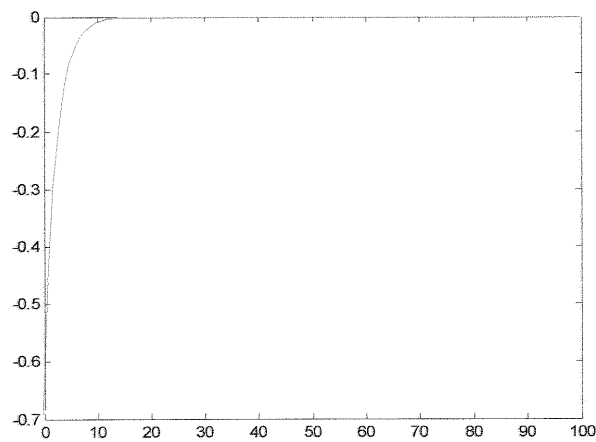


For parts A-D see the code below.

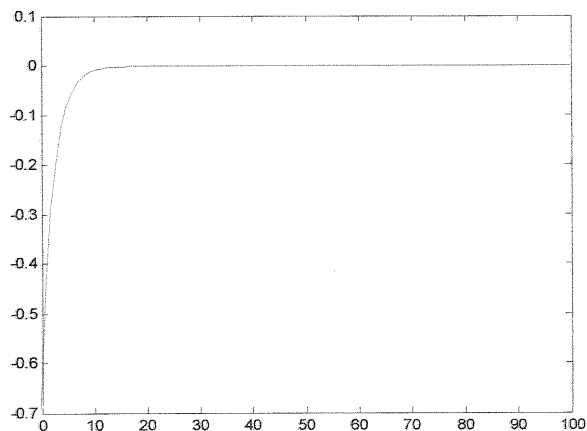
E) Looking between the plots what we see is that to a low level of precision is that the position of the first mass can be approximated simply considering it as its own system, i.e unaffected by the other mass. In part C we solve the equation of motion for the first mass assuming that it is only effected by its eigenvalues (pole on the imaginary plane). When we solve the ODE we solve the entire system of equations (including coupling between the masses). The graphs will look very similar if the eigenvalue for the first mass is the dominant eigenvalue. However, they will look very dis-similar if the eigenvalue for the second mass is dominant.

Similar Plots

Solution to Exponential



Solution to Full Equation



Eigenvalues of the A matrix

Columns 1 through 3

-0.4276	0	0
0	-0.0751	0
0	0	$0.3341 + 0.1085i$
0	0	0

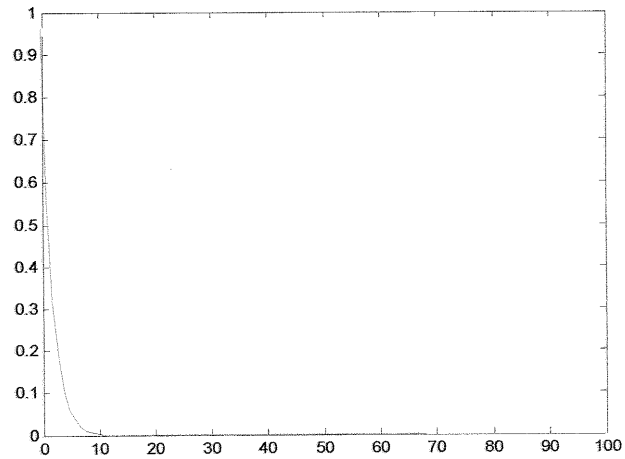
Column 4

0
0
0
$0.3341 - 0.1085i$

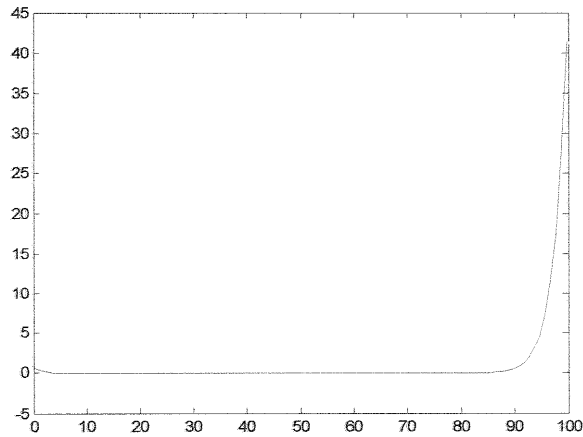
Note that since the first eigenvalue is dominant the movement of the first mass based on this single value well approximated the movement of the mass when attached to the system.

Dis-similar plots

Solution to Exponential



Solution to Full Equation



Eigenvalues of the A matrix
Columns 1 through 3

-0.5517	0	0
0	0.4348	0
0	0	0.0052 + 0.1413i
0	0	0

Column 4

0
0
0
0.0052 - 0.1413i

Note that as t increases the instability of the last 3 poles will cause the system to go to infinity

Code

```
function []=Homework32()
n=4;
A=rand(n,n)-.5
[evvec e]=eig(A)
t=0:1:100;
for k=1:length(t)
    y(k)=real(exp(e(1,1)*t(k))*evvec(1,1));
end
figure(1)
plot(t,y)
w=real(evvec(:,1))
```

%Use ODE45 to solve

```
x0=w;
z0=x0';
```

```
[t zarray] = ode23(@rhs,t, z0,[],A);
```

```
figure(2)
plot(t,zarray(:,1))
end
```

```
function zdot=rhs(t,z,A)
```

```
zdot=A*z;
```

```
end
```