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## Solving system of first of differential equations using matrix method

```
clc
clear all
syms t c1 c2
c=[c1 c2];
A=input('Enter the matrix A in dy/dx=Ay+h:');
h=input('Enter h as a column vector in dx/dt=Ay+h:');
n=length(A);
[P,D]=eig(A);
PP=inv(P);
g=PP*h;
for i=1:n
    u(i)=c(i)*exp(D(i,i)*t)+(exp(D(i,i)*t)*int(g(i)*exp(-
D(i,i)*t)));
end
disp('The solution vector is given by :-')
x=simplify(P*transpose(u))
```

### Problem -1

Enter the matrix A in  $dy/dx=Ay+h$ : $\begin{bmatrix} -2 & -4 \\ -1 & 1 \end{bmatrix}$

Enter h as a column vector in  $dx/dt=Ay+h$ : $\begin{bmatrix} 2*t-1 \\ \sin(t) \end{bmatrix}$

The solution vector is given by :-

x =

$\frac{t}{3} + \frac{(2 \cdot 50^{1/2} \cos(t - \arctan(7)))}{25} + \frac{(2^{1/2} c_2 \exp(2t))}{2} - \frac{(4 \cdot 17^{1/2} c_1 \exp(-3t))}{17} - \frac{4}{9}$

$\frac{t}{3} - \frac{(10^{1/2} \sin(t + \arctan(9/13)))}{10} - \frac{(2^{1/2} c_2 \exp(2t))}{2} - \frac{(17^{1/2} c_1 \exp(-3t))}{17} - \frac{1}{9}$

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## Problem -2

Enter the matrix A in  $dy/dx=Ay+h:[0 \ 1 \ ; -2 \ 3]$

Enter h as a column vector in  $dx/dt=Ay+h:[0;\cos(t)]$

The solution vector is given by :-

$x =$

$$\begin{aligned} & \cos(t)/10 - (3*\sin(t))/10 - (5^{(1/2)}*c2*\exp(2*t))/5 - (2^{(1/2)}*c1*\exp(t))/2 \\ & - (3*\cos(t))/10 - \sin(t)/10 - (2*5^{(1/2)}*c2*\exp(2*t))/5 - (2^{(1/2)}*c1*\exp(t))/2 \end{aligned}$$