

```
A = [-1 0 8; 0 -2 0; 0 0 -3]
```

```
A = 3x3
    -1     0     8
     0    -2     0
     0     0    -3
```

```
B = [0 2; 3 0; 0 0]
```

```
B = 3x2
     0     2
     3     0
     0     0
```

```
C = [1 0 -1]
```

```
C = 1x3
     1     0    -1
```

```
D = [0 0]
```

```
D = 1x2
     0     0
```

```
[M, L] = eig(A)
```

```
M = 3x3
    1.0000     0   -0.9701
         0    1.0000     0
         0     0    0.2425
L = 3x3
    -1     0     0
     0    -2     0
     0     0    -3
```

```
syms t
Phi_p = @(t) diag(diag(exp(L * t)));
Phi_p(t)
```

```
ans =

$$\begin{pmatrix} e^{-t} & 0 & 0 \\ 0 & e^{-2t} & 0 \\ 0 & 0 & e^{-3t} \end{pmatrix}$$

```

```
M_inv = inv(M);
Phi = @(t) M * Phi_p(t) * M_inv;
Phi(t)
```

```
ans =

$$\begin{pmatrix} e^{-t} & 0 & 4e^{-t} - 4e^{-3t} \\ 0 & e^{-2t} & 0 \\ 0 & 0 & e^{-3t} \end{pmatrix}$$

```

```
u = @(t) [4; sin(2 * pi * t)];
```

```
syms T  
x_fo = @(t) int(Phi(t - T) * B * u(t), T, 0, t);  
x_fo(t)
```

```
ans =  

$$\begin{pmatrix} -2 \sin(2 \pi t) (e^{-t} - 1) \\ 6 - 6 e^{-2t} \\ 0 \end{pmatrix}$$

```

```
y_fo = @(t) C * x_fo(t) + D * u(t);  
y_fo(t)
```

```
ans = -2 sin(2 pi t) (e^{-t} - 1)
```

```
t_vec = 0:0.02:10;  
y_fun = matlabFunction(y_fo(t));  
plot(t_vec, y_fun(t_vec))
```

