$$\begin{cases} \dot{x} = Ax + Bu \\ y = Cx \end{cases}$$

$$A = \begin{bmatrix} 0 & 1 \\ 2 & 1 \end{bmatrix} \qquad B = \begin{bmatrix} 0 \\ 1 \end{bmatrix} \qquad C = \begin{bmatrix} -2 & 1 \end{bmatrix}$$

Eigenvalues $\lambda_1 = -1 \qquad \lambda_2 = 2$

$$v_1 = \begin{bmatrix} 1 \\ -1 \end{bmatrix} \qquad v_2 = \begin{bmatrix} 1 \\ 2 \end{bmatrix}$$

$$M(t) = \begin{bmatrix} e^{-t} & e^{2t} \\ -e^{-t} & 2e^{2t} \end{bmatrix} \qquad M(0) = \begin{bmatrix} 1 & 1 \\ -1 & 2 \end{bmatrix}$$

$$\phi(t) = \frac{1}{3} \cdot \begin{bmatrix} 2e^{-t} + e^{2t} & -e^{-t} + e^{2t} \\ -2e^{-t} + 2e^{2t} & e^{-t} + 2e^{2t} \end{bmatrix}$$

$$\lim_{t \to \infty} \phi(t) = \begin{matrix} ? \\ 0 \end{matrix}$$

$$x(t) = \phi(t) \cdot x(0) + x_p(t) - \phi(t) \cdot x_p(0)$$

$$y(t) = C \cdot \phi(t) \cdot x(0) + C x_p(t) - C \phi(t) \cdot x_p(0)$$

$$\begin{bmatrix} -2 & 1 \end{bmatrix} \cdot \phi(t) \cdot \begin{pmatrix} x_{01} \\ x_{02} \end{pmatrix} = \frac{1}{3} \begin{bmatrix} -4e^{-t} - 2e^{2t} & -2e^{-t} + 2e^{2t} & 2e^{-t} - 2e^{2t} & +e^{-t} + 2e^{2t} \end{bmatrix} \begin{pmatrix} x_{01} \\ x_{02} \end{pmatrix}$$

$$= \frac{1}{3} \begin{bmatrix} -6e^{-t} & 3e^{-t} \end{bmatrix} \begin{bmatrix} x_{01} \\ x_{02} \end{bmatrix}$$

$$\lim_{t \to \infty} \to ?$$

system internal unstable but BIBO stable !!

/Users/mey/Documents/MATLAB/ornek.m

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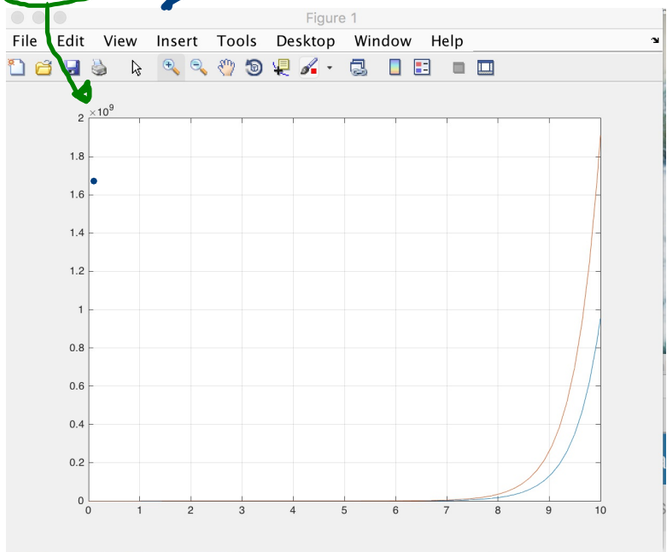
```
1  function xdot = ornek(t,x)
2  xdot(1,1) = 0*x(1)+1*x(2);
3  xdot(2,1) = 2*x(1)+1*x(2)+10;
4
```

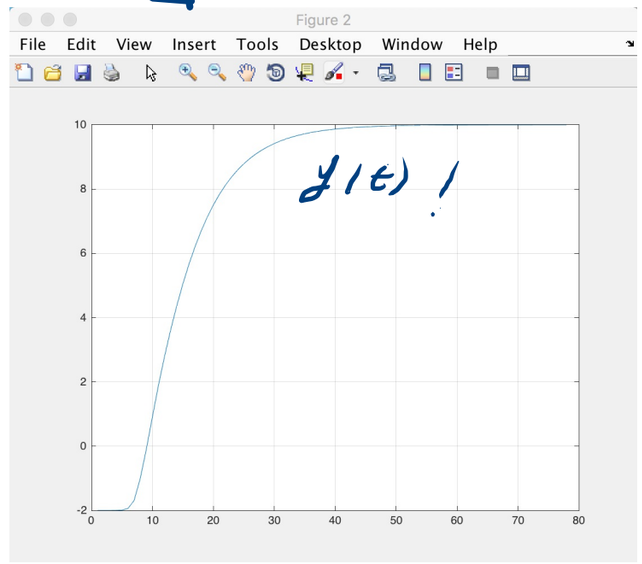
ornek Ln 4 Col 1

```
>> [t,y]=ode23('ornek',[0 10],[1 0]);
>> plot(t,y(:,1),t,y(:,2))
>> figure;
>> plot(-2*y(:,1)+y(:,2))
>>
```

2x10^9 !



! UNSTABLE !



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