Capacitor:

$$\frac{dV}{dt} = -\frac{I}{C}$$

$$= -2I$$

Inductor:

$$\frac{dI}{dt} = -\frac{v}{L} = \boxed{-3v}$$

Form: $y' = Ay$

$$\begin{bmatrix} V \\ I \end{bmatrix}' = \begin{bmatrix} 0 & -2 \end{bmatrix} \begin{pmatrix} V \\ I \end{pmatrix}$$

Need: v as a function of V, I.

using Kirkhoff's Laws

Loop, Current I:

$$\frac{5}{3}I - v - V = 0$$

sc: $\boxed{v = -V + \frac{5}{3}I}$

$$V'(t) = 0V - 2I$$

$$I'(t) = -3v = -3(-V + 5/3\, I)$$

$$= 3V - 5I$$

$$\begin{pmatrix} V' \\ I' \end{pmatrix} = \begin{pmatrix} 0 & -2 \\ 3 & -5 \end{pmatrix} \begin{pmatrix} V \\ I \end{pmatrix}$$