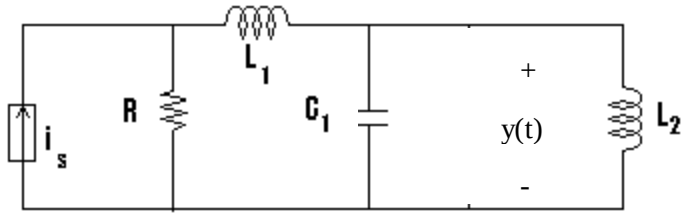
1. Find state equations for the following systems:

a) $\ddot{y} + 2\dot{y} + 4y = 2v$

b) $\ddot{y} - 4y = v$

c) $y[n+2] + 2y[n+1] + 4y[n] = 2v[n]$

2. Find state equations for the following circuit.



3. Find the transfer functions of the following systems:

a)

$$\dot{x} = \begin{bmatrix} -3 & -1 \\ -4 & -2 \end{bmatrix} x + \begin{bmatrix} 1 \\ 0 \end{bmatrix} v$$
$$y = \begin{bmatrix} 4 & -1 \end{bmatrix} x$$

b)

$$x[n+1] = \begin{bmatrix} 0 & 1 \\ -1 & -3 \end{bmatrix} x[n] + \begin{bmatrix} 0 \\ 1 \end{bmatrix} v[n]$$
$$y[n] = \begin{bmatrix} 1 & -1 \end{bmatrix} x[n] + v[n]$$

4. Find the step response of the systems defined in problem 3.