EECS20n, Quiz 4, 10/14/04, Solution

1. **5 points** Consider the difference equation

$$y(n) = 0.5x(n-2) + x(n-1) + x(n). \tag{1}$$

a. What state would you choose to obtain an $[A, b, c^T, d]$ representation for this system?

The state can be $\boxed{s(n) = [x(n-1), x(n-2)]^T}$

b. What is the $[A, b, c^T, d]$ representation for your choice of the state?

$$A = \begin{bmatrix} 0 & 0 \\ 1 & 0 \end{bmatrix}, \quad b = \begin{bmatrix} 1 \\ 0 \end{bmatrix}, \quad c^T = [1 \quad 0], \quad d = [1]$$

c. What is the zero-state impulse response h of the system (1)?

$$h(0) = 1, h(1) = 1, h(2) = 0.5, h(n) = 0, n \geq 3.$$

2. **5 points** Plot $y = h * x$ for signals h, x shown below. Carefully mark the values of y.