Beau Pugsley

DSP Homework 5

1. $y(n) + 0.2y(n-1) = 100x(n)$

$y(n) = 100x(n) - .2y(n-1)$

$y(n) = 100\delta(n) - 0.2y(n-1)$

$y(0) = 100(1) - .02y(-1)$

$y(0) = 100$

$y(1) = -0.2y(0)$

$-0.2y(0)$

$y(1) = -0.2(100)$

$\boxed{y(n) = 100(.2)^n u(n)}$

2. $y(n) - 1.1y(n-1) = x(n) + x(n-1)$

$y(n) = \delta(n) + \delta(n-1) + 1.1y(n-1)$

$y(0) = 1 + 0 + 1.1(0)$

$y(0) = 1$

$y(2) = 1.1(2.1)$

$y(2) = 2.31$

$y(1) = 0 + 1 + 1.1(1)$

$y(1) = 2.1$

$\boxed{y(n) = \delta(n) + 2.1\delta(n-1) + n1.1\,\delta(n-2)}$

3a) $y_1(n) = x(n) * h(n)$

$x(n) = \delta(n) + 2\delta(n-1) - \delta(n-3)$

$h(n) = 2\delta(n+1) + 2\delta(n-1)$

$[\delta(n) - 2\delta(n-1) - \delta(n-3)][2\delta(n+1) + 2\delta(n-1)]$

$[\{1, 2, 0, -1\}][\{2, 0, 2\}]$

2 0 2

Matlab plot in documents

$\boxed{y(n) = 2\delta(n) + 4\delta(n-1) + 2\delta(n-2) + 2\delta(n-3) - 2\delta(n-5)}$

3b) $y_2(n) = x(n+2) * h(n)$

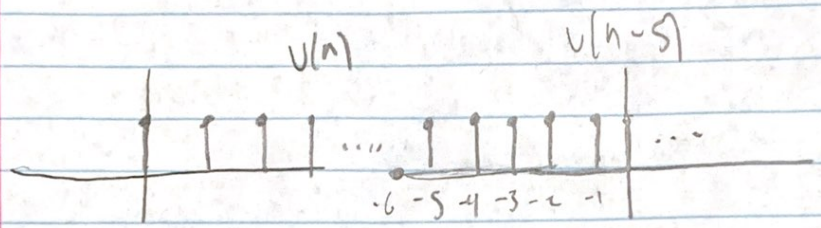
$x(n+2)\{1, 2, \overset{*}{0}, -1\}$ $\quad h(n) = \{2, 0, 2\}$

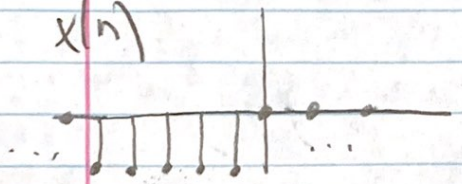
$y(n) = \{1, 0, 0, -3\}$

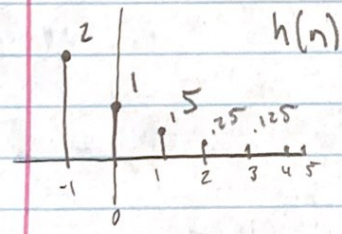
$\boxed{y(n) = \delta(n+2) - 3\delta(n-1)}$

4. $x(n) = u(n) - u(n-5)$ $\quad h(n) = 0.5^n u(n)$

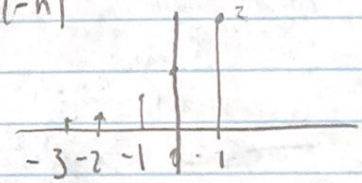
$y(n) = x(n) * h(n)$



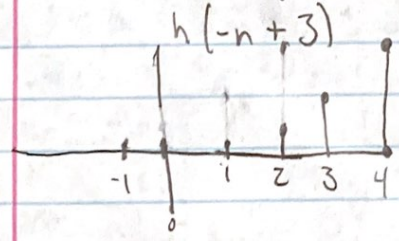




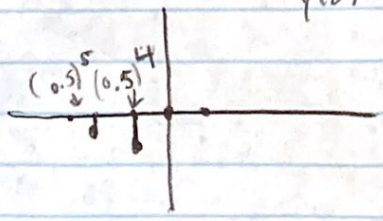
find $h(-n)$



Shift $h(-n)$ right 3 to find $y(3)$



$y(3) = x(n)h(-n+3)$



$y(3) = (0.5)^4 - (0.5)^5 - (0.5)^6 - \cdots$