

Problem 10.3

Given, $y[n] = 0.5y[n - 1] + 5x[n - 1]$

Taking z-transform gives,

$$Y(z)[1 - 0.5z^{-1}] = 5X(z)z^{-7}$$

$$\Rightarrow H(z) = \frac{Y(z)}{X(z)} = \frac{5z^{-7}}{1-0.5z^{-1}}. \text{ There is 1 pole at } z = 0.5.$$

Hence, the impulse response using time invariance can be expressed as:

$$h[n] = 5(0.5)^{n-7}u[n - 7]$$

Plot of $h[n]$:

