

HW 8: Stability, Causality, and Use of the Z-Transform

1. Determine whether each of the following discrete time systems is stable then determine if each is causal. In each case, also write down the difference equation, relating $y[n]$ and $x[n]$:

(a) $h[n] = 0.5^n u[n]$

(b) $h[n] = 0.5^n u[n + 1]$

(c) $h[n] = 2^n u[n]$

(d)

$$H(z) = \frac{(1 + 3z^{-1})}{(1 - 0.9z^{-1})(1 + 0.2z^{-1})}, |z| > 0.9$$

(e)

$$H(z) = \frac{z^4(1 - 0.3z^{-1})}{(1 - 0.9z^{-1})(1 + 0.2z^{-1})}, |z| > 0.9$$

(f)

$$H(z) = \frac{(1 - 0.3z^{-1})(1 + 3z^{-1})}{(1 - 1.9z^{-1})(1 + 0.2z^{-1})}, |z| > 1.9$$

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

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

2. Use Z-Transforms to find the output of the filter having the given impulse response $h[n]$ and input $x[n]$:

(a) Problem 1 of HW 5.

(b) Problem 6 of HW 5.

(c) Problem 7 of HW 5.

(d) Problem 9 of HW 5.