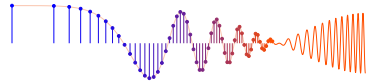


PROBLEM:

For each of the difference equations below, determine the poles and zeros of the corresponding system function, $H(z)$. Plot the poles **(X)** and zeros **(O)** in the complex z-plane.

$$\mathcal{S}_1: \quad y[n] = 0.4y[n-1] + x[n] + x[n-1]$$

$$\mathcal{S}_3: \quad y[n] = -0.75y[n-1] + x[n] - x[n-1]$$

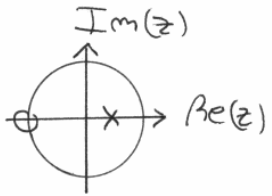
$$\mathcal{S}_6: \quad y[n] = x[n] - x[n-1] + x[n-2] - x[n-3]$$

$$\mathcal{S}_7: \quad y[n] = x[n] + \tfrac{1}{4}x[n-1] - \tfrac{3}{4}x[n-2]$$

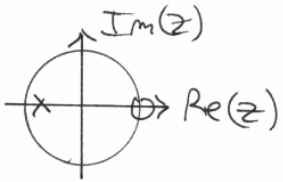
McClellan, Schafer and Yoder, *Signal Processing First*, ISBN 0-13-065562-7.
Prentice Hall, Upper Saddle River, NJ 07458.

SOLUTION

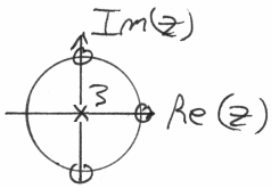
(S1) $H_1(z) = \dfrac{1 + z^{-1}}{1 - 0.4 z^{-1}}$ zero at $z = -1$, pole at $z = 0.4$



(S2) $H_2(z) = \dfrac{1 - z^{-1}}{1 + 0.75 z^{-1}}$ $z_z = 1$, $z_p = -0.75$



(S3) $H_3(z) = 1 - z^{-1} + z^{-2} - z^{-3}$ $z_z = 1, j, -j$, poles at $z = 0$



(S4) $H_4(z) = 1 + \frac{1}{4} z^{-1} - \frac{3}{4} z^{-2}$ $z_z = -1, \frac{3}{4}$, poles at $z = 0$