

PROBLEM:

A linear time-invariant filter is described by the difference equation

$$y[n] = 0.8y[n - 1] - 0.8x[n] + x[n - 1]$$

- Determine the system function $H(z)$ for this system. Express $H(z)$ as a ratio of polynomials in z^{-1} (negative powers of z) and also as a ratio of polynomials in positive powers of z .
- Plot the poles and zeros of $H(z)$ in the z -plane.
- From $H(z)$, obtain an expression for $H(e^{j\hat{\omega}})$, the frequency response of this system.
- Show that $|H(e^{j\hat{\omega}})|^2 = 1$ for all $\hat{\omega}$.