

## 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  $\hat{\omega}$ .