

PROBLEM:

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

$$y[n] = 3x[n] + 2x[n - 1] + 2x[n - 2] + 3x[n - 3]$$

- (a) Write a simple formula for the magnitude of the frequency response $|\mathcal{H}(\hat{\omega})|$. Express your answer in terms of real-valued functions only.
- (b) Derive a simple formula for the phase of the frequency response $\angle \mathcal{H}(\hat{\omega})$.
- (c) *Impulse Response:* Determine the response of this system to a unit impulse input; i.e., find the output $y[n] = h[n]$ when the input is $x[n] = \delta[n]$. Plot $h[n]$ as a function of n .