PROBLEM:

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

$$y[n] = 2x[n] + 4x[n-1] - 4x[n-3] - 2x[n-4]$$

(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.