

PROBLEM:

An LTI system has the following system function:

$$H(z) = \frac{1 + z^{-2}}{1 + 0.3z^{-1}}.$$

The following questions cover most of the ways available for analyzing IIR discrete-time systems.

- (a) Plot the poles and zeros of $H(z)$ in the z -plane.
- (b) Use z -transforms to determine the impulse response $h[n]$ of the system; i.e., the output of the system when the input is $x[n] = \delta[n]$.
- (c) Determine an expression for the frequency response $H(e^{j\hat{\omega}})$ of the system.
- (d) Use the frequency response function to determine the output $y_1[n]$ of the system when the input is

$$x_1[n] = 2 \cos(\pi n) \quad -\infty < n < \infty.$$