



## PROBLEM:

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

$$y[n] = \frac{1}{3} (x[n] + x[n - 1] + x[n - 2])$$

- Determine the system function  $H(z)$  for this system.
- 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.
- Sketch the frequency response (magnitude and phase) as a function of frequency for  $-\pi \leq \hat{\omega} \leq \pi$ .
- What is the output if the input is

$$x[n] = 4 + \cos[0.25\pi(n - 1)] - 3 \cos[(2\pi/3)n]$$