

EE 451

Homework #6

Due October 1, 2001

1. Problem 4.9. Use MATLAB to plot $|H(e^{j\omega})|$ and $\angle H(e^{j\omega})$
2. A causal linear time-invariant system is described by the difference equation

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

- (a) Find the transfer function $H(z)$ for this system. Plot the poles and zeros of $H(z)$, and indicate the region of convergence.
 - (b) Find the impulse response $h[n]$ of the system.
3. When the input to a linear system is

$$x[n] = \left(\frac{1}{2}\right)^n \mu[n] + (2)^n \mu[-n-1],$$

the output is

$$y[n] = 6 \left(\frac{1}{2}\right)^n \mu[n] - 6 \left(\frac{3}{4}\right)^n \mu[n].$$

- (a) Find the system function $H(z)$ of the system. Plot the poles and zeros of $H(z)$, and indicate the region of convergence.
 - (b) Find the impulse response $h[n]$ of the system for all values of n .
 - (c) Write the difference equation that characterizes the system.
 - (d) Is the system stable? Is it causal?
4. The transfer function of a linear time-invariant system has the pole-zero diagram shown below. Specify whether each of the following statements is true, false, or cannot be determined from the information given.
 - (a) The system is stable.
 - (b) The system is causal.
 - (c) If the system is causal, then it must be stable.
 - (d) If the system is stable, then it must have a two-sided impulse response.

