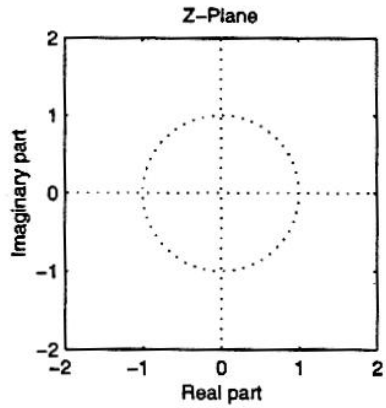
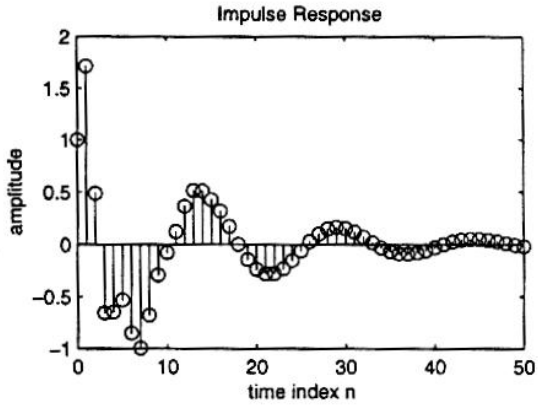
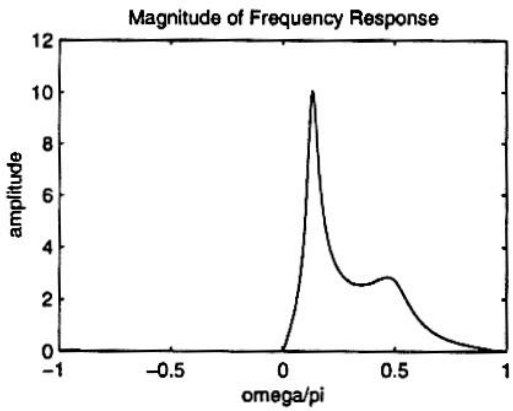
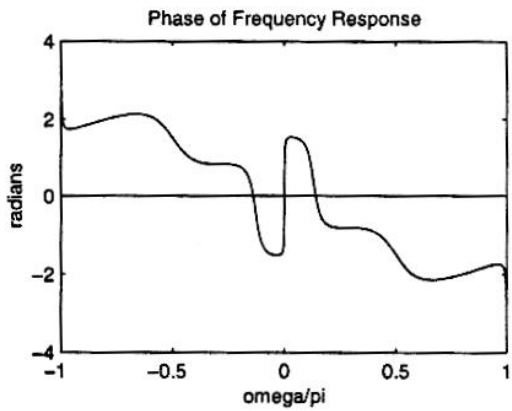
PROBLEM:

Consider the following output from the PEZ program:









(a) Is this a FIR or IIR system? Explain your answer.

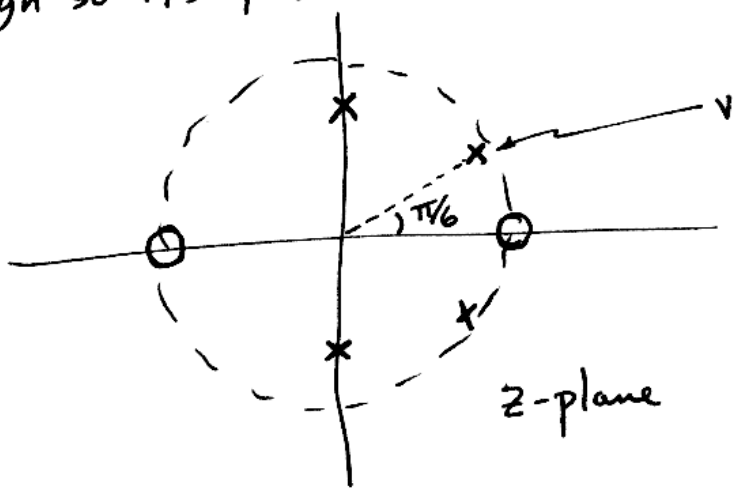
(b) Fill in an estimate of pole-zero plot corresponding to other plots in the figure. Place the poles and zeros to indicate which ones are on the unit circle, which are close to the unit circle, and which are relatively farther away. Also fill in the missing part of the magnitude of the frequency response; i.e., for $-\pi < \hat{\omega}/\pi < 0$.

McClellan, Schafer and Yoder, *Signal Processing First*, ISBN 0-13-065562-7.
Prentice Hall, Upper Saddle River, NJ 07458.

SOLUTION

(a) The system is IIR because the impulse response is not finite length. It lasts at least 50 samples.

(b) The frequency response is zero at $\hat{\omega}=0$ & $\hat{\omega}=\pi$. The two peaks are due to pole pairs at angles of $\pi/2$ and $\pi/6$. The peak at $\pi/6$ is narrow and high so its pole is closer to the unit circle.



Magnitude Response must be symmetric: