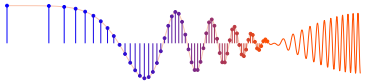

PROBLEM:

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

$$y[n] = 0.8y[n-1] + 4x[n] - 5x[n-1]$$

(a) Determine the system function $H(z)$ for this system. Express $H(z)$ as a ratio of polynomials in z^{-1} (negative powers of z).

(b) Plot the poles and zeros of $H(z)$ in the z-plane.
Hint: express $H(z)$ as a ratio of polynomials in positive powers of z.

(c) Show that $|H(e^{j\hat{\omega}})|^2$ is a constant for all $\hat{\omega}$; and determine the value of the constant.
Hint: From $H(z)$, obtain an expression for $H(e^{j\hat{\omega}})$, the frequency response of this system.

(d) (Optional) Use `freqz` or the `pez` GUI from the lab to verify your answer.

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