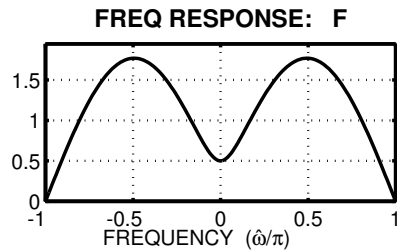
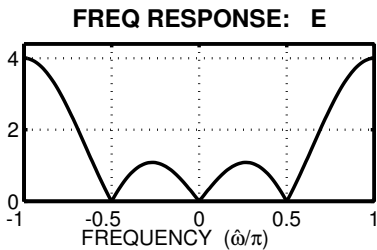
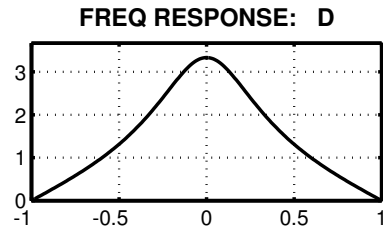
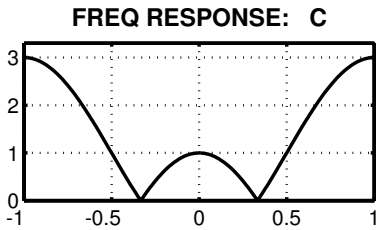
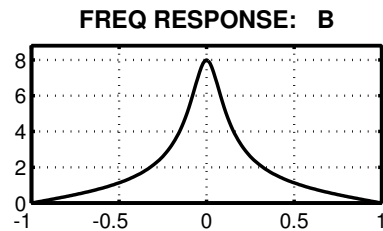
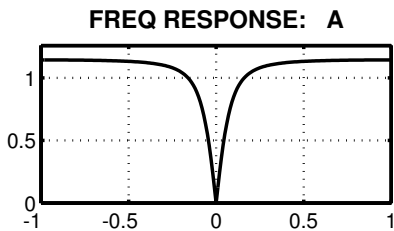


**PROBLEM:**

For each of the frequency response plots (A, B, C, D, E, F), determine which one of the following systems (specified by either an  $H(z)$  or a difference equation) matches the frequency response (magnitude only). NOTE: frequency axis is **normalized**; it is  $\hat{\omega}/\pi$ . In addition, derive a formula for the magnitude-squared of the frequency response,  $|H(e^{j\hat{\omega}})|^2$ , for  $\mathcal{S}_3$  and  $\mathcal{S}_4$ .

$$\mathcal{S}_1 : \quad y[n] = 0.4y[n-1] + x[n] + x[n-1]$$

$$\mathcal{S}_2 : \quad H(z) = \frac{1 + z^{-1}}{1 - 0.75z^{-1}}$$

$$\mathcal{S}_3 : \quad y[n] = -0.75y[n-1] + x[n] - x[n-1]$$

$$\mathcal{S}_4 : \quad H(z) = \frac{1 - z^{-1}}{1 - 0.75z^{-1}}$$

$$\mathcal{S}_5 : \quad y[n] = x[n] - x[n-1] + x[n-2]$$

$$\mathcal{S}_6 : \quad H(z) = 1 - z^{-1} + z^{-2} - z^{-3}$$

$$\mathcal{S}_7 : \quad y[n] = x[n] + \frac{1}{4}x[n-1] - \frac{3}{4}x[n-2]$$

$$\mathcal{S}_8 : \quad H(z) = \frac{1}{3}(1 - z^{-1})^3$$