PROBLEM:

Suppose that a system is defined by the following operator

$$H(z) = (1 - z^{-1})\frac{1 + z^{-4}}{1 - 0.8z^{-2}}$$

(a) Write the time-domain description of this system—in the form of a difference equation.

(b) Write the formula for the frequency response of the system.

(c) Derive a simple formula for the magnitude squared of $\mathcal{H}(\hat{\omega})$ response versus $\hat{\omega}$.

(d) This system can "block" certain input signals. For which input frequencies $\omega_\circ$, is the response to $x[n] = \cos(\omega_\circ n)$ equal to zero?

(e) When the input to the system is $x[n] = \cos(\pi n/3)$ determine the output signal $y[n]$ in the form:

$$A\cos(\omega_\circ n + \phi)$$

Give numerical values for the constants A, $\omega_\circ$ and ϕ.