PROBLEM:

The system function of a discrete-time LTI system has the following equivalent forms:

$$H(z) = \frac{2 + 2z^{-1}}{1 - 0.25z^{-2}} = \frac{2 + 2z^{-1}}{(1 - 0.5z^{-1})(1 + 0.5z^{-1})} = \frac{3}{1 - 0.5z^{-1}} - \frac{1}{1 + 0.5z^{-1}}$$

(a) Determine the impulse response of this system; i.e., determine the output $h[n]$ when the input is $\delta[n]$.

(b) Using the form

$$H(z) = \frac{2 + 2z^{-1}}{1 - 0.25z^{-2}},$$

determine an expression for the frequency response as a function of $\hat{\omega}$.

(c) Use the frequency response function to determine the output $y[n]$ when the input is

$$x[n] = e^{j(\pi/2)n} \quad \text{for } -\infty < n < \infty$$