Exercises Week 9

DSP

1. A signal $x[n]$ has a Z transform with one pole $p_1 = -0.5$ and one zero $z_1 = 0.9$. It is known that at $\omega = \pi$, the modulus of the Fourier transform is $|X(\omega = \pi)| = 1$.
   a. Find the signals's Z transform $X(z)$
   b. Find the values $|X(\frac{\pi}{2})|$, $|X(\frac{-\pi}{2})|$ and $|X(0)|$
   c. Compute the expression of $|X(\omega)|$ and $\angle X(\omega)$
   d. Sketch $|X(\omega)|$

2. Consider the following system: $y[n] = 0.8y[n-1] + \frac{1}{2}x[n] - \frac{1}{2}x[n-1]$. What kind of filter is this?
   a. Low-pass filter
   b. Band-pass filter
   c. High-pass filter
   d. Band-stop filter