
title: Exercises Week 10 subtitle: DSP documentclass: scrartcl fontsize: 12pt

1. Find the DFT coefficients of the periodic signal with period $\{1, 1, 0, 0\}$, and write the signal as a sum of sinusoidal components.
2. Find the DTFT of the signal $\{1, 1, 0, 0\}$, considering it is surrounded with infinitely-long zeros on both sides
3. 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 signal's Z transform $X(z)$
 - b. Compute the expression of $|X(\omega)|$ and $\angle X(\omega)$
 - c. Find the values $|X(\frac{\pi}{2})|$, $|X(\frac{-\pi}{2})|$ and $|X(0)|$
 - d. Sketch $|X(\omega)|$
4. Design the pole-zero plot of a signal with:
 - low frequency content
 - frequency content around the frequency $\omega = \frac{\pi}{2}$