Exercises Week 12

DSP

1. Design the pole-zero plot of a signal with:

   - low frequency content
   - frequency content around the frequency $\omega = \frac{\pi}{2}$

2. A digital filter has the following properties:

   - it is a high-pass filter of order 1
   - the pole is situated at a distance 0.9 from the origin
   - constant signals are completely blocked by the filter

   Requirements:

   a. Draw the pole-zero diagram and find the system function $H(z)$
   b. Compute the amplitude response and the phase response of the filter
   c. Normalize the filter such that $|H(\pi)| = 1$
   d. Find the output signal $y[n]$ if the input signal is $x[n] = 2\cos(\frac{\pi}{6}n + \frac{\pi}{4}), n \in \mathbb{Z}$