

# Exercises Week 12

## DSP

1. 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  $x[n] = 2 \cos(\frac{\pi}{6}n + \frac{\pi}{4})$ ,  $n \in \mathbb{Z}$