# Digital Signal Processing

http://kom.aau.dk/~zt/cources/Digital_signal_processing/

## Exercises of Lecture 2 (MM2)

Exercise 2.1. The Fourier transform $X(e^{j\omega}) = \dfrac{1}{1 - ae^{-j\omega}}$, $with\ -1 < a < 0$.

a) What is the value of $\left|X(e^{j\omega})\right|$ ?

b) What is the value of $\angle X(e^{j\omega})$ ?

Exercise 2.2. Find the Z-transform and ROC of the following sequences

a) $(½)^n u[n]$

b) $-(½)^n u[-n-1]$

c) $\delta[n-1]$

Exercise 2.3. The input to a LTI-system is $u[n]$ and the output $y[n]$ is $y[n] = \left(\frac{1}{2}\right)^{n-1} u[n+1]$.

Find the transfer function, H(z).

Exercise 2.4. Given the Z-transform $X(z) = \dfrac{1 - \frac{1}{2}z^{-1}}{(1 + \frac{3}{4}z^{-1} + \frac{1}{8}z^{-2})}$, $|z| > \frac{1}{2}$. Try using partial fraction expansion to find x[n].

Exercise 2.5. Given the transfer function $H(z) = \dfrac{1 + z^{-1}}{(1 - \frac{1}{2}z^{-1})(1 + \frac{1}{4}z^{-1})}$ of a causal LTI system.

Is the system stable ? (First find the ROC)