COMMUNICATION THEORY, Homework Assignment 3, Fall 2023

1) Derive the autocorrelation function and the energy spectral density function of a rectangular impulse $x(t) = \Pi\left(\frac{t-1}{2}\right)$.

2) Assume that the rectangular impulse $x(t)$ is used as the input signal for a device with impulse response $h(t) = 2\delta(t-1)$ and derive the cross-correlation function between the input and the output signals.

Hint: you can either solve the correlation integrals, or apply the same graphical method shown in the lecture notes for convolution, by carefully consider the difference between convolution and correlation.