

Applied Signal Processing and Computer Science

WS 11/12

Tutorial 4: Convolution

1. Graphical Convolution:

1.1. Convolve graphically the following functions $u(t) * h(t) = g(t)$ and draw $u(t)$, $h(t)$ and $g(t)$:

- $\text{rect}\left(\frac{t-T_1}{T_1}\right) * \text{rect}\left(\frac{t}{T_2}\right)$ with $T_1 = 2$ and $T_2 = 3$
- $\text{rect}\left(\frac{t}{T}\right) * (-2\gamma(t))$
- $[2\delta(t+2T) + 3\delta(t+T) - 2\delta(t) + \delta(t-T)] * \text{tri}\left(\frac{t}{T}\right)$

2. Analytical Convolution:

2.1. Convolve analytically the following functions:

- $\exp\left(\frac{-t^2}{a_1^2}\right) * \exp\left(\frac{-t^2}{a_2^2}\right)$

2.2. Convolve graphically and analytically the following functions:

- $\left(\cos(t) \cdot \text{rect}\left(\frac{t}{\pi}\right)\right) * \gamma(t)$

3. Discrete-time convolution:

Perform the discrete-time convolution $u[n] * h[n]$ of the following signals $u[n]$ and $h[n]$. Represent the steps of the convolution graphically.

