

# Data Processing and Analysis

Homework 1; Due 2/7/05

January 21, 2005

(1) Express  $\delta(\alpha t)$  in terms of  $\delta(t)$ .

(2) Show analytically whether or not correlation obeys commutative, distributive (under addition) and associative laws. Verify your conclusions using Matlab examples with illustrative functions.

(3) Analytically evaluate the following convolutions, where  $\alpha$  and  $\beta$  are positive constants. Plot and check your analytic results using Matlab.

- a)  $[e^{-\alpha t} H(t)] * [e^{-\beta t} H(t)]$   
(consider all cases for  $\alpha$  and  $\beta$ ).
- b)  $\Pi(t) * \Pi(t)$
- c)  $\Pi(t) * \Pi(t) * \Pi(t) * \Pi(t)$   
(use a result from (2) to make this easier).
- d)  $[\alpha \cos \pi t H(t)] * [\delta(t) - \delta(t - 2)]$

**Extra credit:** Do (2), but for convolution rather than crosscorrelation.