Data Processing and Analysis

Homework 1; Due 2/2/04
January 15, 2004

(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) $[e^{-\alpha t} H(t)] \ast [e^{-\beta t} H(t)]$
   (consider all cases for $\alpha$ and $\beta$).

b) $\Pi(t) \ast \Pi(t)$

c) $\Pi(t) \ast \Pi(t) \ast \Pi(t) \ast \Pi(t)$
   (use a result from (2) to make this easier).

d) $[\alpha \cos \pi t H(t)] \ast [\delta(t) - \delta(t - 2)]$

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