ECE 300
Signals and Systems
Homework 1

Due Date: Tuesday September 9, 2008 *at the beginning of class*

Reading: Roberts pages 1-28 and your course notes.

Problem:

1) Simplify the following as much as possible. Use unit step functions where necessary instead of inequalities.

a) $y(t) = \delta(t)\delta(t-2) =$ 0

b) $y(t) = \int_{-\infty}^{\infty} \delta(\lambda)\delta(\lambda-2)d\lambda =$ 0

c) $y(t) = \int_{-\infty}^{\infty} \delta(\lambda)\delta(\lambda-t)d\lambda =$ $\delta(t)$

d) $y(t) = \int_{0}^{t-1} e^{-(t-\lambda)}\delta(\lambda-1)d\lambda =$ $e^{-(t-1)}u(t-2)$

e) $y(t) = \int_{-\infty}^{\infty} e^{-(t-\lambda)}\delta(t-\lambda)d\lambda =$ 1

f) $y(t) = x(t)\delta(t-3) + \delta(t) =$ $x(3)\,\delta(t-3) + \delta(t)$

g) $y(t) = \int_{-\infty}^{\infty} [x(\lambda)\delta(t-\lambda) + \delta(\lambda)]d\lambda =$ $x(t) + 1$

h) $y(t) = \int_{-\infty}^{t} u(\lambda)u(\lambda-2)\mathrm{d}\lambda =$ $(t-2)u(t-2)$

i) $y(t) = \int_{-\infty}^{t} u(\lambda)u(\lambda+2)\mathrm{d}\lambda =$ $t\,u(t)$

j) $y(t) = \int_{-\infty}^{\infty} u(1-\lambda)u(\lambda-1)d\lambda =$ 0

k) $y(t) = \int_{-\infty}^{t} e^{-2(t-\lambda)}\delta(\lambda-1)d\lambda =$ $e^{-2(t-1)}u(t-1)$

l) $y(t) = \int_{-\infty}^{\infty} u(\lambda+1)u(1-\lambda)d\lambda =$ 2

m) $y(t) = \int_{-\infty}^{t-2} e^{-2(t-\lambda)}\delta(\lambda)d\lambda =$ $e^{-2t}u(t-2)$

n) $y(t) = \int_{-5}^{8} \delta(\lambda+10)d\lambda =$ 0

o) $y(t) = \int_{t-1}^{\infty} \delta(\lambda)d\lambda =$ $u(1-t)$