

Homework #8

Due: Tuesday, April 12, 2011

Note: Use of Matlab (or any other software) is not permitted.

1. (Exercise 7.7) Find the value of each of the following “integrals” (these are symbolic integrals, not Riemann or Lebesgue integrals).
 - a. (1pt) $\int_{-\infty}^{\infty} \delta(x-2)e^{-\pi x^2} dx$
 - b. (1pt) $\int_{-\infty}^{\infty} \delta'(x-1)e^{-\pi x^2} dx$
 - c. (1pt) $\int_{-\infty}^{\infty} \delta''(x)e^{-\pi x^2} dx$
 - d. (1pt) $\int_{-\infty}^{\infty} [\cos(\pi x)\delta(x)]e^{-\pi x^2} dx$
 - e. (1pt) $\int_{-\infty}^{\infty} [\sin(\pi x)\delta'(x)]e^{-\pi x^2} dx$
2. (Exercises 7.8, 7.11) Find and simplify the functional $f\{\Phi\}$, $\Phi \in \mathcal{S}$, that is used to represent the generalized function f when:
 - a. (1pt) $f(x) = \delta'(2x)$
 - b. (1pt) $f(x) = \Pi'(x)$
 - c. (1pt) $f(x) = \delta''(x-5)$
 - d. (1pt) $f(x) := \frac{27}{(x^2 + 5x + 4)^2} = \frac{2}{x+4} + \frac{3}{(x+4)^2} - \frac{2}{x+1} + \frac{3}{(x+1)^2}$
 - e. (1pt) $f^\wedge(s) = \delta''(s)$

Total: 10 pts (1 point each)