PHYS 3101 Homework 9

April 20, 2006; due April 27, 2006

1. Calculate the values of the following integrals:
   (a) $I_1 = \int_{-\infty}^{\infty} \delta(x - \pi/4) \tan(x) dx$,
   (b) $I_2 = \int_0^4 \delta(x - 3) \left[x^2 + 4x + 2\right] dx$,
   (c) $I_3 = \int_0^{\infty} \delta(x + 1) \left[x^3 + 4\right] dx$,
   (d) $I_4 = \int_{-\infty}^{\infty} \delta(x - \pi) \sin(x) \cos(x) dx$.
2. Write $\delta(x^2 - 4)$ in terms of a sum of ordinary delta functions.
3. Write $\delta(\sin(x))$ in terms of a sum of ordinary delta functions (an infinite number!).
4. Calculate the values of the following integrals involving derivatives of delta functions:
   (a) $J_1 = \int_{-\infty}^{\infty} \delta'(x - \pi) \sin(x) dx$,
   (b) $J_2 = \int_{-\infty}^{\infty} \delta''(x) e^{4x} dx$.