

## HOMWORK ASSIGNMENT 9

Name:

Due: Tuesday April 30, 4PM

1. Compute the Fourier transform of  $\frac{x}{(x^2 + 1)^2}$ .
2. Using Fourier transform, compute  $\int_{-\infty}^{\infty} \frac{\sin(x)}{x(x^2 + 1)}$ .
3. The function  $f(x)$  has Fourier transform  $\hat{f}(\omega) = \frac{1}{|\omega|^3 + 1}$ . Compute

$$\int_{-\infty}^{\infty} |(f * f')(x)|^2 dx.$$

Hint: For problems 1, 2 and 3, look among the typical Fourier transforms, as well as the common properties (charts on page 345, 346 of W. Strauss book).

From W. Strauss book:

4. Section 12.3: Problem 4 (a),(b).
5. Section 12.3: Problem 5 (a):
  - (a) Show that  $\delta * f = f$  for any function  $f$ , where  $\delta$  is the delta distribution.Note: The convolution of a distribution  $T$  with a function  $f$  is a function defined by  $(T * f)(x) = (T, \tau_x f)$ , where  $\tau_x f(y) = f(x - y)$ .
6. Section 12.4: Problem 1
7. Section 12.4: Problem 2
8. Section 12.4: Problem 6