Math 464: Midterm Exam #2 Prof. Doron Levy April 14, 2015

Solve all 4 problems.

1. (25 points)

(a) (10 points) Compute the Fourier transform of the following two functions:



- (b) (15 points) Use the Fourier transforms from part (a) to compute f * g.
- 2. (25 points) Let $f(x) = \max(1, x^2)$.
 - (a) (12 points) Sketch f(x) and compute f'''(x).
 - (b) (13 points) Use f'''(x) to compute the Fourier Transform of f(x).
- 3. (30 points)
 - (a) (15 points) Show that $\operatorname{sinc}(x) \cdot \operatorname{III}(x) = \delta(x)$.
 - (b) (15 points) Evaluate $\int_{-\infty}^{\infty} (\delta' * \delta')(x) e^{-\pi x^2} dx.$
- 4. (20 points) Use Poisson's relation to find the Fourier series for the *p*-periodic function

$$f(x) = |\sin(\pi x/p)|.$$