MATH 464, FALL 2007, FINAL REVIEW

1) Express the Inverse Fourier Transform of the following function, in terms of the Inverse Fourier Transform of f (here a, b, c denote arbitrary positive constants):

$$\frac{d}{dx}\left(ae^{-2\pi iabx}f(a(x+c))\right).$$

2) Compute explicitely the Fourier Transform of the following function (here $*$ denotes the convolution as defined for the purposes of the Fourier Transform):

$$f = \chi_{[0,2\pi]} * \sin.$$

3) Calculate the Fourier coefficients of the following $2T$-periodic, locally integrable function:

$$f(x) = \begin{cases} x, & x \in [-T, 0), \\ -x, & x \in [0, T). \end{cases}$$

4) 2) Find the one-sided inverse Laplace transforms of functions:

a)

$$\frac{4s+4}{s^2(s-2)},$$

b)

$$\frac{4s+10}{(s+1)^2} + \frac{3}{(s+1)^4}.$$

5) Compute explicitely the Laplace Transform of the following function (here $*$ denotes the convolution as defined for the purposes of the Laplace Transform):

$$f = \chi_{[0,2\pi]} * \sin.$$

6) Solve the problem $y'(t) + y(t) = e^{2t}$, $y(0) = 0$.

7) Compute the 4×4 Discrete Haar Transform of the vector $(1, 2, 3, 4)$.