SIMG-717-20052
Homework Assignment #2 Due 12/14/2005 (W)

1. Use the results derived in class to evaluate the 1-D Fourier transforms of:

$$\begin{aligned} f_1[x] &= J_0[2\pi\xi_0 x] \\ f_2[x] &= \frac{J_1(2\pi\xi_0 x)}{2\pi\xi_0 x} \end{aligned}$$

   Sketch the functions and their Fourier transforms.

2. Find expressions for the moments of the following functions and use them to evaluate the areas, mean values, and variances.

   (a) $f[x] = SINC[x]$

   (b) $g[x] = SINC^2[x]$

   (c) $h[x] = \frac{1}{b}e^{-\left(\frac{x}{b}\right)}STEP[x]$

   (d) $GAUS[x]$

3. Evaluate the first four moments of the functions in the previous problem and use them to construct an equation that approximates each spectrum; graph the approximate spectra.

4. Find the algebraic expression for the moments of $f[x] = \delta[x - x_0]$ and show that the resulting power series are identical to the spectra for $x_0 = 0$ and $x_0 = 1$.