

**Homework #5**

Due Date: Feb. 14, 2005

1. O&W 3.28.
2. (a) For the function in Figure P3.28(b), use Matlab to numerically determine the Fourier series coefficients for  $0 \leq k \leq 5$ . Compare to analytic determination from problem 1.

(b) Matlab's FFT function implements the following formula: 
$$X(k) = \sum_{n=0}^{N-1} x(n)e^{-i\frac{2\pi}{N}nk}$$

Also, Use Matlab's FFT function and determine  $\text{fft}(x)/N$ . Compare to part a.

3. O&W 3.31
4. O&W 3.35
5. O&W 3.36
6. Consider the function  $x(n) = \cos(\omega_0 n) + 2\cos(3\omega_0 n)$  where  $\omega_0 = 2\pi/16$ .
  - a. What is the fundamental period ( $N$ ) and what are the Fourier Series coefficients?
  - b. Create about several periods of this function and apply as an input to the function f4.m. Plot the input and output signals.
  - c. Determine the impulse response to f4.m and from that determine the frequency response of the system,  $H(e^{ik\omega_0})$ , for  $k = 0, 1, 2, 3$ .
  - d. Use the result of part c. to determine the periodic output function and plot several periods of this function. Compare to the result of part b.