

**ECE130B: Home Work #7**

Due March 3, 2008.

Reading assignments don't have to be turned in.

1. **Reading assignment:** Chapter 5 and sections 3.0–3.2, 3.6–3.8.
2. Given that  $x[n]$  has the Fourier transform  $\mathcal{X}(\omega)$ , express the Fourier transforms of the following signals in terms of  $\mathcal{X}(\omega)$ .
  - (a)  $x_1[n] = x[2 - n] + x[n - 2]$
  - (b)  $x_2[n] = \overline{x[-n]}$
  - (c)  $x_3[n] = (1 + n + n^2)x[n]$
3. Find the signal  $x[n]$  whose Fourier transform is given by

$$\mathcal{X}(\omega) = \frac{1}{1 - e^{-j\omega}} \frac{\sin(\frac{5}{2}\omega)}{\sin \frac{\omega}{2}} + 2\pi\delta(\omega), \quad -\pi < \omega \leq \pi.$$

4. Let  $\mathcal{X}(\omega)$  be the Fourier transform of a real signal  $x[n]$ . Show that  $x[n]$  can be written as

$$x[n] = \int_0^\pi (\mathcal{B}(\omega) \cos(\omega n) + \mathcal{C}(\omega) \sin(\omega n)) d\omega,$$

by finding expressions for  $\mathcal{B}(\omega)$  and  $\mathcal{C}(\omega)$  in terms of  $\mathcal{X}(\omega)$ . Are  $\mathcal{B}(\omega)$  and  $\mathcal{C}(\omega)$  real-valued functions?

5. Do the following problems from the textbook: 5.22.(d), 5.22.(e), 5.23.(f).(ii), 5.25, 5.26, 5.31.