

**MthSc 208: Differential Equations (Summer II, 2010)**  
**In-class Worksheet 6b: Complex Fourier Series**

**NAME:**

Consider the square wave defined by  $f(x) = \begin{cases} 1, & 0 \leq x < \pi \\ -1, & -\pi \leq x < 0 \end{cases}$  and extended to be  $2\pi$ -periodic.

1. Sketch  $f(x)$  and find its complex Fourier coefficients (i.e.,  $c_0$  and  $c_n$ ).

2. Write  $f(x)$  as a *complex Fourier series*:  $f(x) = \sum_{n=-\infty}^{\infty} c_n e^{-inx} = c_0 + \sum_{n=1}^{\infty} (c_n e^{-inx} + c_{-n} e^{inx})$ .

3. Find the real Fourier coefficients. Recall that  $a_n = c_n + c_{-n}$  and  $b_n = i(c_n - c_{-n})$ .