MthSc 208: Differential Equations (Fall 2010)
In-class Worksheet 17: Complex Fourier Series

NAME:

Consider the square wave defined by $f(x) = \begin{cases} 1, & 0 \le x < \pi \\ -1, & -\pi \le x < 0 \end{cases}$ and extended to be 2π-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 $b_n = i(c_n - c_{-n})$.