

## Math 2080: Differential Equations

### Worksheet 6.4: Complex Fourier series

**NAME:**

Consider the function defined by  $f(x) = x$  for  $-\pi \leq x \leq \pi$  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  $b_n = i(c_n - c_{-n})$ .