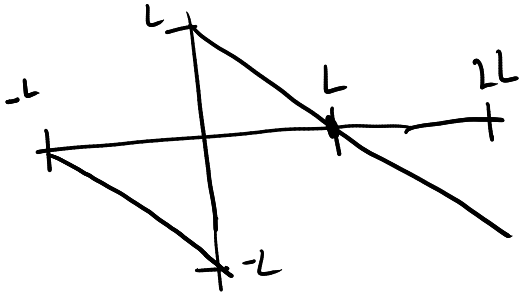
NAME & EID: Solutions

M 427K Quiz 10 **November 28, 2012** **Instructor: James Pascaleff**

- Show all work. No books, notes, calculators, or other electronic devices.

1. (3 points) If $f(x) = L - x$ on the interval $0 < x < 2L$, and $f(x + 2L) = f(x)$, find a formula for $f(x)$ on the interval $-L < x < 0$.



$f(x) = -L - x$ on $-L < x < 0$

2. (7 points) Consider the function $f(x)$ which is periodic with period $2L$ and determined on the interval $-L \leq x < L$ by

$$f(x) = \begin{cases} 1, & -L \leq x < 0 \\ 0, & 0 \leq x < L \end{cases}$$

Find the coefficient b_1 in the Fourier series

$$f(x) = \frac{a_0}{2} + \sum_{m=1}^{\infty} a_m \cos \frac{m\pi x}{L} + b_m \sin \frac{m\pi x}{L}$$

$$b_1 = \frac{1}{L}\int_{-L}^{L} f(x) \sin \frac{\pi x}{L}\, dx = \frac{1}{L}\int_{-L}^{0} \sin \frac{\pi x}{L}\, dx = \frac{1}{L}\left[-\frac{L}{\pi}\cos\frac{\pi x}{L}\right]_{-L}^{0}$$

$$= \frac{1}{L}\frac{L}{\pi}\left[-\cos 0 + \cos(-\pi)\right] = \frac{1}{\pi}\left[-1 - 1\right] = \frac{-2}{\pi}$$