Assignment # 9

Due Wednesday, 7 December, 2011 at start of class.

***Lesson 11*, # 4.**

***Lesson 12*, # 1.**

***Lesson 12*, # 3.**

***Lesson 12*, # 4.**

P6. Using the fact that $e^{i\theta} = \cos\theta + i\sin\theta$, show that

$$\frac{e^{i\theta} + e^{-i\theta}}{2} = \cos\theta, \qquad \frac{e^{i\theta} - e^{-i\theta}}{2i} = \sin\theta.$$

P7. **(a)** Using the formulas for complex Fourier series on the interval $[-L, L]$, namely these two,

$$\boxed{z_n = \frac{1}{2L}\int_{-L}^{L} f(x)e^{-i(n\pi x/L)}\,dx, \quad n \text{ is any integer}}$$

$$\boxed{f(x) = \sum_{n=-\infty}^{\infty} z_n e^{i(n\pi x/L)}}$$

compute the complex Fourier series of $f(x) = x$ on the interval $-1 < x < 1$. (*Hint*: The integration-by-parts formula for $\int x e^{\alpha x}\,dx$ works fine when α is complex. But be very careful with signs and with the $n = 0$ case.)

(b) Convert your result from part **(a)** to a Fourier series with real coefficients and simplify as much as possible. Thus you will be able to check the formula in part **(a)** against known Fourier series, including one entry in a table at the end of the textbook. (*Hints*: Note $1/i = -i$, and use the result of **P6**.)