Reading: O&W-3.3, 3.4, 3.5, 3.8 (continuous time signals only)

S2) The signal $x(t)$ is periodic, with period 2, and

$$x(t) = \begin{cases} 
  t + 1 & -1 < t < 0 \\
  1 - t & 0 < t < 1 
\end{cases}$$

Determine the Fourier series for $x(t)$.

[Hint: Make use of the properties of Fourier series to simplify this problem]

S3) If $x(t)$ is a periodic signal with the following Fourier series coefficients

$$a_k = \begin{cases} 
  1 & k = 0 \\
  \frac{k}{1 + |k|} & \text{otherwise}
\end{cases}$$

(i) Is $x(t)$ a real valued function of time?

(ii) Is $x(t)$ an even function of time?

(iii) Is $dx(t)/dt$ an even function of time?

S4) For the following signals

$$x(t) = \cos(\pi t)$$
$$y(t) = \sin(\pi t)$$
$$z(t) = x(t)y(t)$$

and with a fundamental period of $T=2$,

i) Determine the Fourier series coefficients for $x(t)$ and $y(t)$.

ii) Use the results of part (i), along with the multiplication property of Fourier series, to determine the Fourier series for $z(t)$.

[Hint: part (ii) can be greatly simplified by using the fact that there are only a few non-zero coefficients in the Fourier series’ for $x(t)$ and $y(t)$]