

*Phys 3010 Mathematical Physics*  
*Assignment 17*

---

Find the Fourier series for each of the following, and plot the function, truncating the series if necessary. You will need to set up the integrals by hand, but rather than work out each (tedious) integral separately, you can use Maple to save time.

1. The asymmetric square wave  $f(t)=1$  for  $0 \leq t \leq \frac{1}{4}T$ ,  $f(t)=0$  for  $\frac{1}{4}T \leq t \leq \frac{3}{4}T$ , and  $f(t)=-1$  for  $\frac{3}{4}T \leq t \leq T$ .
2. The triangle wave, which rises linearly to  $f(\frac{1}{2}T) = 1$  and then falls linearly to  $f(T)=0$
3. The sawtooth wave, which rises linearly from  $f(0)=0$  to  $f(T)=1$ .
4. The wave  $f(t) = \sin(2\pi t/T) * \cos^3(6\pi t/T)$ . Note: Maple will find four of these integrals to be undefined using a general formula, as there is the possibility that the denominator is zero. Set up each one of these separately.

In each case use Maple to make a plot of the Fourier series, using (say) the first twenty terms.