

Mee390 Example 2.3 on p.57

Determine the Fourier series that represents the square wave function: $y(t)=-1$ for $-5<t<0$ and $y(t)=1$ for $0<t<5$ and it is periodic with period $T=10$, i.e. $y(t+T)=y(t)$.

N := 30 ... arbitrary number of the Fourier series terms. The larger the better!

T := 10 given function period

t := -6, -5.95.. 6 ... independent variable range for plotting the function

The Fourier series coefficients:

$$B(n) := \frac{2}{10} \cdot \left[\int_{-5}^0 (-1) \cdot \sin\left(\frac{2 \cdot n \cdot \pi \cdot t}{10}\right) dt + \int_0^5 (1) \cdot \sin\left(\frac{2 \cdot n \cdot \pi \cdot t}{10}\right) dt \right]$$

$$B(n) := -2 \cdot \frac{(-1 + \cos(n \cdot \pi))}{(n \cdot \pi)} \quad y(t, N) := \sum_{n=1}^N B(n) \cdot \sin\left(\frac{2 \cdot n \cdot \pi}{T} \cdot t\right) \quad B(3) = 0.424$$

Plot of function represented with N (assign an arbitrary value above) and 5 terms for example:

