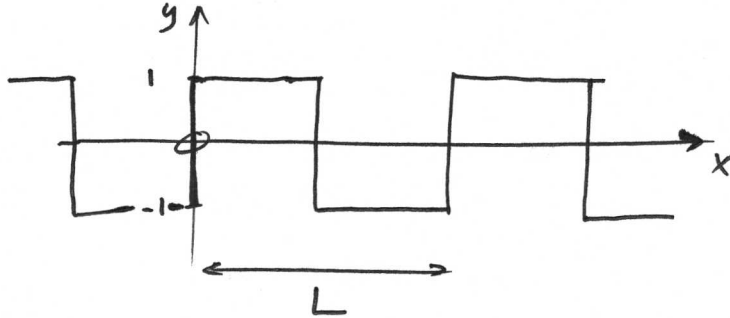


- ① Consider the square wave with period L .



The square wave can be represented as an infinite sum of sine waves

$$\sum_{n=1}^{\infty} A_n \sin\left(\frac{2\pi n x}{L}\right)$$

Make use of the orthogonality relation

$$\int_0^L \sin\left(\frac{2\pi n x}{L}\right) \sin\left(\frac{2\pi n' x}{L}\right) dx = \frac{L}{2} \delta_{nn'}$$

To find A_n , the ~~nth~~ n^{th} coefficient in the series.

② consider $f(x) = \begin{cases} 1 & 0 < x < 1 \\ -1 & -1 < x < 0 \end{cases}$

Write $f(x)$ as an infinite sum of Legendre polynomials.

Make use of the orthogonality relation for Legendre polynomials.