

6. For the squarewave:

(a) period $T = \pi$

$$(b) \phi_n(t) = \sin\left(\frac{2\pi n t}{\pi}\right) = \sin(2nt) \quad \left. \vphantom{\phi_n(t)} \right\} \text{ form of Fourier terms.}$$

(c) Fourier coefficients

$$A_n = \frac{\int_{-\frac{\pi}{2}}^0 -\sin(2nt) dt \int_0^{\frac{\pi}{2}} \sin(2nt) dt}{\int_{-\frac{\pi}{2}}^{\frac{\pi}{2}} \sin^2(2nt) dt} = \frac{\frac{1 - \cos(n\pi)}{n}}{\frac{\pi}{2}}$$

$$\Rightarrow A_n = \frac{2(1 - \cos(n\pi))}{n \cdot \pi} \Leftrightarrow A_n = \begin{cases} \frac{4}{n\pi} & , n \text{ odd} \\ 0 & , n \text{ even} \end{cases}$$

$$f_s \sim \sum_{\substack{n=1 \\ n \text{ odd}}}^{\infty} \frac{2(1 - \cos(n\pi))}{n \cdot \pi} \cdot \sin(2nt)$$