Serial #

**-1 points for not writing your serial number**

**King Fahd University of Petroleum & Minerals**
Electrical Engineering Department
EE207: Signals and Systems (111)
**Quiz 3**: Fourier series
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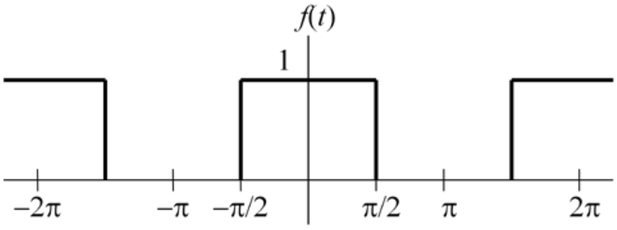
Name: ver. 1

For the shown periodic signal $f(t)$, the trigonometric Fourier series is given by

$$f(t) = a_0 + \sum_{n=1}^{\infty} a_n \cos(2\pi n f_0 t) + \sum_{n=1}^{\infty} b_n \sin(2\pi n f_0 t)$$

Find $a_0$, $a_3$,$a_4$, $b_1$,$b_2$. (Show steps or reasoning)




$a_0$ =0.5 average value by inspection.

$b_1$=$b_2$ =0 because the given function is even.

$a_4$=0 because the signal is similar to the cases of half wave odd symmetry with dc shift ($a_0$)

$T$=2π => $\omega$=1

$$a_n = \frac{2}{2\pi}\int_{-\frac{\pi}{2}}^{\frac{\pi}{2}} \cos(nt)\ dt = \frac{1}{\pi n}\left[\sin nt\right]_{-\frac{\pi}{2}}^{+\frac{\pi}{2}} = \frac{1}{\pi n}\left(\sin\left(\frac{n\pi}{2}\right) - \sin\left(\frac{-n\pi}{2}\right)\right) = \frac{2}{\pi n}\sin\left(\frac{n\pi}{2}\right)$$

Clearly $\sin\left(\frac{n\pi}{2}\right)$=0 for even values of $n$ and alternating +1, -1 for odd values of $n$.

$$a_3 = \frac{2}{\pi 3}\sin\left(\frac{3\pi}{2}\right) = \frac{-2}{3\pi}$$