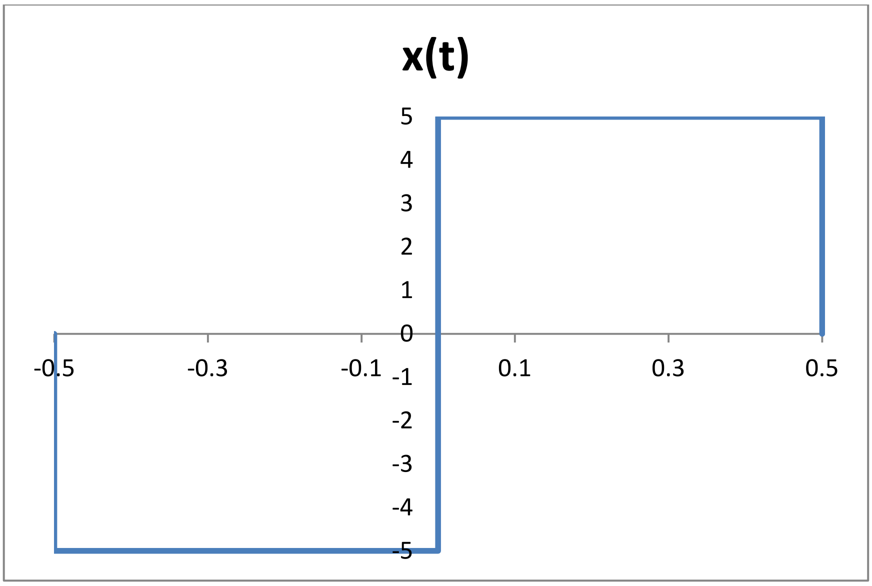

$$C_n = \frac{1}{T}\int_{<T>} x(t)e^{-jn\omega_0 t}\,dt$$

The answer my lecture got is:

$$C_n = \begin{cases} \dfrac{10}{jn\pi} & n\ odd \\ 0 & n\ even \end{cases}$$

My attempt:

As $x(t)$ is an odd function C_n can be simplified to only having sin terms, meaning it is purely imaginary.

$$\Rightarrow C_n = \frac{-2j}{T}\int_{<\frac{T}{2}>} x(t)\sin(n\omega_0 t)dt$$

$$x(t) = 5 \ : \ 0 < t < 0.5 \qquad T = 1 \qquad \omega_0 = 2\pi$$

$$\Rightarrow C_n = \frac{-2j}{1}\int_0^{0.5} 5\sin(n2\pi\, t)dt$$

$$= -2j\left[-\frac{5\cos(n2\pi t)}{n2\pi}\right]_0^{0.5}$$

$$= -2j\left[-\frac{5\cos(n\pi)}{n2\pi}\right] - -2j\left[-\frac{5\cos(0)}{n2\pi}\right]$$

For n odd:

$$= -2j\left[-\frac{-5}{n2\pi}\right] + 2j\left[-\frac{5}{n2\pi}\right]$$

$$= 2j\left[\frac{-5}{n2\pi} - \frac{5}{n2\pi}\right]$$

$$= 2j\left[\frac{-10}{n2\pi}\right]$$

$$= 2j\left[\frac{-5}{n\pi}\right]$$

$$= \frac{-10j}{n\pi}$$

For n even:

$$= -2j\left[-\frac{5}{n2\pi}\right] + 2j\left[-\frac{5}{n2\pi}\right]$$

$$= -\frac{-10j}{n2\pi} - \frac{10j}{n2\pi}$$

$$= \frac{10j - 10j}{n2\pi}$$

$= 0$ As expected.

$$\therefore C_n = \begin{cases} \dfrac{-10j}{n\pi} \; n\,odd \\ 0 \; n\,even \end{cases}$$