

King Fahd University of Petroleum & Minerals

Electrical Engineering Department

EE207: Signals and Systems (121)

Quiz 4: Fourier Transform

Serial #

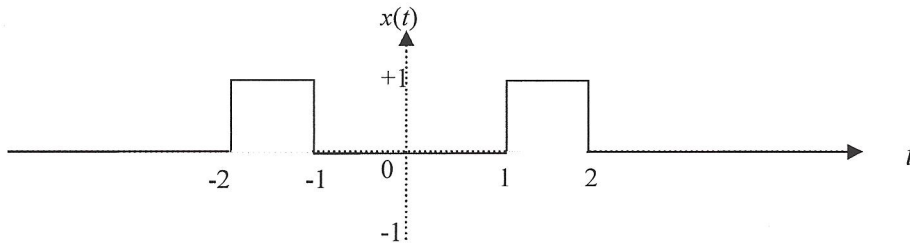
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- 1 points for not writing your serial number

Name: KEY

Sec.

1. For the following signal find the Fourier Transform using two different methods and make sure that the answers are the same:



- a. By integration definition

$$F(\omega) = \int_{-\infty}^{\infty} x(t) e^{-j\omega t} dt = \left[\int_{-2}^{-1} e^{-j\omega t} dt + \int_{1}^{2} e^{-j\omega t} dt \right]$$

$$= \frac{-1}{j\omega} \left[\frac{e^{-j\omega t}}{-1} \Big|_{-2}^{-1} + \frac{e^{-j\omega t}}{-1} \Big|_{1}^{2} \right] = \frac{1}{j\omega} \left[-e^{-2j\omega} + e^{-j\omega} + e^{2j\omega} - e^{j\omega} \right]$$

$$F(\omega) = \frac{2}{\omega} [\sin(2\omega) - \sin(\omega)]$$

- b. Using the attached two tables, find the Fourier transform of $x(t)$. (4 points)

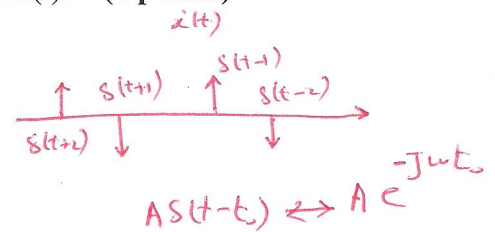
There are many solutions

① By taking the derivatives:

for $x(t)$

$$F(\omega) = e^{2j\omega} - e^{j\omega} + e^{-j\omega} - e^{-2j\omega}$$

$$= j2 [\sin(2\omega) - \sin(\omega)]$$



if we integrate

$$\frac{1}{j\omega} F(\omega) + \pi F(0) \delta(\omega)$$

Equal zero odd function

$$F(\omega) = \frac{2}{\omega} [\sin(2\omega) - \sin(\omega)]$$

We can also write the answer in terms of sine & use other properties like time shifting (1 point)

- c. Compare the two answers above.

The same ↑

- d. Is the F.T pure real, pure imaginary or complex? Why? (1 point)

real . because the original function $x(t)$ is

Even