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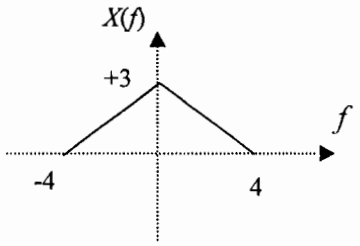
- 1 points for not writing your serial number

King Fahd University of Petroleum & Minerals
Electrical Engineering Department
EE207: Signals and Systems (081)
Quiz 4: Fourier Transform

Name: KEY Ver.

Tables of Fourier Transform Pairs & Properties are attached. Indicate the property or pair that you use.

1. A signal $x(t)$, has the magnitude spectrum shown in the figure. Sketch the spectrum of the following signals $x(2t)+x(t)e^{-j24\pi t}$



From Table 4-1

using the scale change property (3a)

$x(at) \longleftrightarrow |a|^{-1} X\left(\frac{f}{a}\right)$

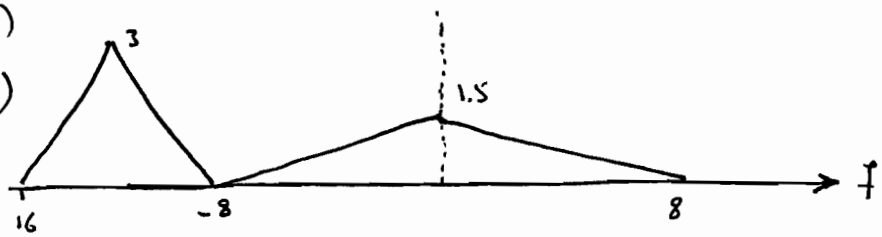
$x(2t) \longleftrightarrow \frac{1}{2} X\left(\frac{f}{2}\right)$

& Using Frequency Translation Property (5a)

$x(t)e^{j2\pi f_0 t} \longleftrightarrow X(f-f_0)$

$x(t)\ e^{+j2\pi(+12)t} \longleftrightarrow X(f+f_0)$

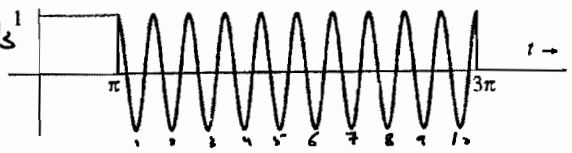
$X(f+12)$



By linearity

$\frac{1}{2} X\left(\frac{f}{2}\right) + X(f+12)$

2. Find the Fourier Transform of the signal shown.
Hint: The signal can be expressed in the form of $g(t)\cos(2\pi f_0 t)$, What is f_0?



① $f_0 = \frac{\#\text{ of cycles}}{\text{Time interval}} = \frac{10}{3\pi-\pi} = \frac{10}{2\pi} = \frac{5}{\pi}$ Hz

$\omega_0 = 2\pi(f_0) = 2\pi\left(\frac{5}{\pi}\right) = 10$ rad/sec.

The signal can be found by

④ $\Pi\left(\frac{t-2\pi}{2\pi}\right)\cos 2\pi\left(\frac{5}{\pi}\right)t$

$\Pi\left(\frac{t}{\tau}\right) \longleftrightarrow \tau\,\text{sinc}(\tau f)$ Table 4.2 ①

$\Pi\left(\frac{t}{2\pi}\right) \longleftrightarrow 2\pi\,\text{sinc}(2\pi f)$

① also Table 4.1 ② Time delay

$\Pi\left(\frac{t-2\pi}{2\pi}\right) \longleftrightarrow 2\pi\,\text{sinc}(2\pi f)\,e^{-j2\pi f(2\pi)}$

① finally using 4.1 (5b) Modulation

$x(t)\cos\omega_0 t \longleftrightarrow \frac{1}{2}X(f-f_0)+\frac{1}{2}X(f+f_0)$

$\pi\,\text{sinc}\left(2\pi\left(f-\frac{5}{\pi}\right)\right)e^{-j\,4\pi^2\left(f-\frac{5}{\pi}\right)}$

$+\pi\,\text{sinc}\left(2\pi\left(f+\frac{5}{\pi}\right)\right)e^{-j\,4\pi^2\left(f+\frac{5}{\pi}\right)}$

①

Good Luck, **Dr. Ali Muqaibel**