

EECS 361
Homework #8

1. (Concept: Finding the Fourier Transform)

Let $x(t) = \cos(2\pi t) \text{rect}(\frac{t}{2})$. Plot $x(t)$ and find $X(\omega)$, the Fourier Transform of $x(t)$ and plot $X(\omega)$ for $|\omega| < 20.0$.

2. (Concept: Finding the Fourier Transform using linearity and delay properties)

Exercise 4.10.3 [Hint: write $f(t)$ as a sum of three rectangular functions.]

3. (Concept: Finding the Fourier Transform)

Find and plot the Fourier Transform of

a. $0.5 \text{rect}(\frac{t}{4}) + \text{tri}(\frac{t}{2})$

b. $\frac{2}{\pi} \text{sinc}(t)$

c. $\frac{e^{-\frac{t^2}{2}}}{\sqrt{2\pi}}$

d. $\frac{e^{-\frac{t^2}{0.03^2}}}{\sqrt{2\pi}}$ (for this signal plot the magnitude spectrum and compare the plot to the part c.)

e. Why are the Fourier Transforms of a., b., and c., purely real function.

4. (Concept: Symmetry properties of the Fourier transform)

a. If $x(t)$ is real and even then the Fourier transform of $x(t)$ is a real and even function.

True or False.

b. If $x(t)$ is real and odd then the Fourier transform of $x(t)$ is purely imaginary and odd function.

True or False.

5. (Concept: Finding energy in the frequency domain using Parseval's theorem)

Find the energy in $x(t) = \frac{2}{\pi} \text{sinc}(t)$ [Hint use result from Problem 3 b and Parseval's theorem]