

**ECE 300**  
**Signals and Systems**  
Homework 8

**Due Date:** Thursday October 27 at 1 PM

**Reading:** K & H, pp. 161-192

**Problems**

1. K & H, Problem 4.15
2. K & H, Problem 4.16 (a,b,c, **not d**)
3. K & H, Problem 4.18 (part **b** only). Do this problem two different ways, first by using the modulation property and then by direct evaluation of the integral using Euler's identify.
4. K & H, Problem 4.20
5. K & H, Problem 4.22
6. K & H, Problem 4.24
7. In this problem we'll look at a real world situation when we have to truncate a data set. This actually happens more with digital signal processing, but we can get the basic idea using our continuous time abilities.
  - a) Find an expression for the Fourier transform of  $f(t) = \cos(4t) + \cos(5t)$  .
  - b) Now assume we look at  $f(t)$  for a finite time, say  $T$  seconds. What we see is actually  $y(t) = f(t)rect(t/T)$  . Determine an expression for the Fourier transform of  $y(t)$  , and write your answers in terms of sinc functions.
  - c) Plot, using your favorite software,  $Y(\omega)$  for  $\omega$  between 0 and 10 when  $T=1$ ,  $T=6$ ,  $T=10$ ,  $T=20$ , and  $T=40$ . Can you clearly tell there are two cosines present when you are looking at  $Y(\omega)$  for all values of  $T$  ? What happens as  $T$  gets larger (you are looking at more and more data)? Think in terms of the width of the sinc function (the distance between the first nulls)