

GEORGIA INSTITUTE OF TECHNOLOGY  
School of Electrical and Computer Engineering

EE3230  
Homework Assignment No. 0

**Date Assigned:** January 7, 1998  
**Date Due:** January 9, 1998

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**Reading Assignment:** To be announced.

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**Homework Assignment:** You should work all of these problems to review things that were learned in EE2200 and EE2250.

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**Problem 0.1:**

A signal composed of sinusoids is given by the equation

$$x(t) = 10 \cos(800\pi t + \pi/4) + 7 \cos(1200\pi t - \pi/3) - 3 \cos(1600\pi t)$$

- (a) Sketch the spectrum of this signal indicating the complex size of each frequency component. You need not make separate plots for real/imaginary or magnitude/phase. You may make either a one-sided or two-sided plot.
- (b) Is  $x(t)$  periodic? If so, what is the period?
- (c) Now consider the signal  $y(t) = x(t) + 5 \cos(1000\pi t + \pi/2)$ . How is the spectrum changed? Is  $y(t)$  periodic? If so, what is the period?

**Problem 0.2:**

Consider the discrete-time system defined by the equation

$$y[n] = x[n] - 2x[n-1] + x[n-2]$$

- (a) Find the frequency response,  $H(e^{j\hat{\omega}})$ , of this system, and plot its magnitude and phase as a function of  $\hat{\omega}$  for  $-\pi < \hat{\omega} < \pi$ .
- (b) Use the frequency response determined in (a) to find the output if the input is

$$x[n] = 10 + 5 \cos(0.5\pi n)$$

**Problem 0.3:**

Consider the following circuit:

Determine the steady-state response of this network to the input signal

$$v_0(t) = 10 + 5 \cos(t)$$