EE313 Lecture 19

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1 Test review

- Properties of Fourier transform
- (see O&W ex 3.9)
- 'Detective story'
- crib sheet
- DFT (O&W 3.4)

2 DFT

DTFS, period N.
definitons:
$x[n] = \sum a_k \cdot e^{j2\frac{\pi}{N}kn}$
$k \in \{0, 1, ..N-1\}$
$a_N = \frac{1}{N}\sum x[n] \cdot e^{-j\frac{2\pi}{N}kn}$
$n \in \{0, 1, ..N-1\}$
Example:
$x[n] = \sin(\frac{2\pi}{5}) = \frac{1}{2j}e^{j(\frac{2\pi}{5})n} - \frac{1}{2j}e^{-j(\frac{2\pi}{5})n}$
$\therefore a_1 = \frac{1}{2j}, a_{-1} = -\frac{1}{2j}$
$a_{-1} = a_4$,
$a_1 = a_5$
Plot the graph.

3 DE's and the transfer function

$RC = \frac{dx}{dt} + V_c(t) = V_s(t)$
constant coefficent linear DE$\rightarrow$LTI and causal.
Assuming initial rest,
$V_s(t) = e^H \xrightarrow{LTI} Hjwe^{st}$.
Laplace of Impulse

To find transfer function:
$RC \cdot \frac{dv_c(t)}{dt} + v_c(t) = v_s(t)$
maek transfer function
...
$H(s) = \frac{1}{1+RCs}$
Also maek freq resp:
...
$H(jw) = \frac{1}{1+RCjw}$
Maek plot.
Watch filter. (see O&W 3.10.2 High pass ex)

4 Recapitulation

- Properties of Systems (memoryless, LTI, etc.)
- Discrete and Continuous convolutions
- DFT, CFT, properties of Fourier transforms, computing basic signals (square pulse, sinusoids)
- Solving DE's to get transfer function and frequency response
  Also be able to plot the magnitude and angle of the freq. response.
- No inverse Fourier trasform. Read examples.