ELL205 Signals and Systems

Tutorial 2, 7 August - 11 August 2023

1) Problems 1.18-1.19 of the textbook. Answers to these are available in the textbook itself. DO try to work out before the tutorial class and discuss in case you have questions.
2) Problems 1.21,1,22,1,27-1,30 of the textbook. Some (not all) of these will be discussed in the tutorial class. It is important for you to try out these problems before the tutorial class. Parts of 1.27,1.28 and 1.30 will be "discussed" in the tutorials. You will have to solve these in full later in case you do not complete in the tutorial session.

- To confirm invertibility, check to see if two different inputs can result in the same output (mapping is many to one from input to output). If you think the system is not invertible, just looking for any two inputs (defined from $-\infty$ to ∞) that results in the same output for all time is proof that the system is not invertible. Proof by counter-example is often the simplest. Intuition helps..
- To prove that a system is not causal, a simple counter-example suffices as proof. For example if $y[n] = x[-n]$, simply state that the output at $n = -1$ depends on input $x[n]$ at $n = 1$, which means that the system is NOT causal.
- In many problems, making a sketch can give you a lead to the answer.
- Many students make mistakes when sketching $x[2-n]$ or using properties.. It is best to think that you start with $x[n]$, advance it in time by 2 to get $x[n+2]$ and then perform time-reversal in the next step. Do no interchange these steps! The same logic applies to time-scaling.
- Note the Leiniz tule of integration in $https://en.wikipedia.org/wiki/Leibniz_integral_rule$. It might be required for some problems.
- $$y[n] = \begin{cases} x[n/2] & n \text{ even} \\ 0 & n \text{ odd} \end{cases}$$

  is referred to as interpolation. You can equivalently write the above as

  $$y[n] = \sum_{r=-\infty}^{\infty} x[r]\delta[n-2r]$$

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