Digital Signal Processing
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Lecture 34: Properties of the Z-transform (4) -Relationship between $x[n]$ and $X(1)$

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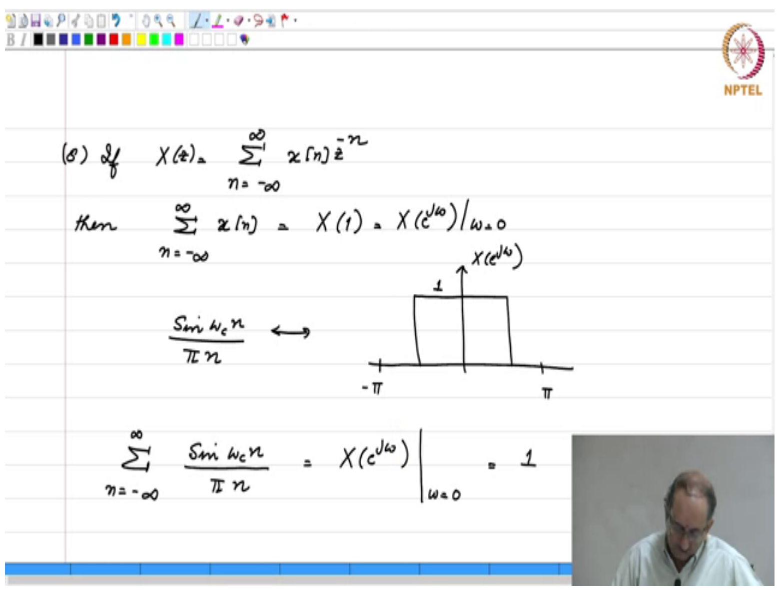

We look up another property which states as follows; if $X(z) = \sum_{n=-\infty}^{\infty} x[n]z^{-n}$, then this is $X(1)$, $X(1) = \sum_{n=-\infty}^{\infty} x[n]$. This is pretty straight forward here, all you need to put is put $z = 1$ and you get this. Later, we will see this DTFT pair. We will derive this, we need the inverse DTFT definition for deriving this particular pair. So, we will state the result for now and then derive this later, we will just merely use the result.

And this of course, is $X(1) = X(e^{j\omega})|_{\omega=0} = \sum_{n=-\infty}^{\infty} x[n]$, same thing. You can use this for the DTFT definition also, right. And, if you apply this particular property, you get this result. This is nothing, but $X(e^{j\omega})$ at $\omega = 0$ and in this particular case given that the transform of this is this, at $\omega = 0$ the value is 1. If you did not have this property, to derive this result will be very difficult; to show that this is indeed true is very difficult whereas, using this property it follows very easily.