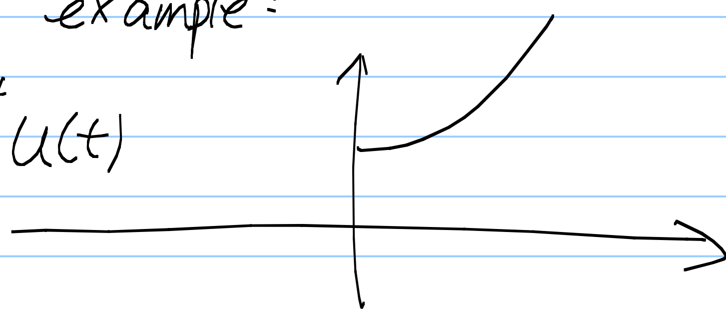
Note Title 12/6/2012

Section 10: The Z-transform

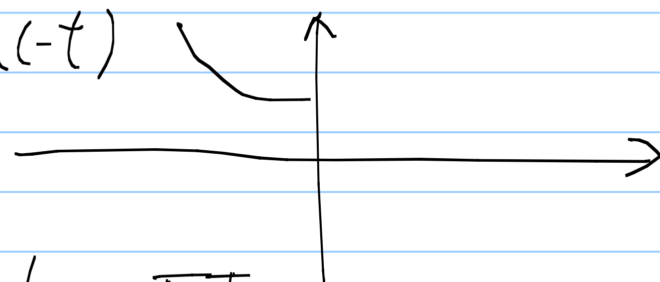
FT is a powerful analytical tool, but it has its limitations.

For example:

$e^{t}u(t)$



& $e^{-t}u(-t)$



do not have FT.

How do we do freq analysis for signals that blow up.

We need more general, more powerful tools:

CT signals: the Laplace Transform

DT signals: the Z transform

* Unfortunately, more powerful usually means less straightforward than the FT. We need to take into account new concepts like "Region of Convergence (ROC)"

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* Digital Signal Processing is important. Let us focus on the Z-transform.
* Here is our approach.

Consider $x[n] = a^n u[n]$, $|a|>1$. Suppose we kill the <u>blowing up</u> aspect of $x[n]$ by "exponential time weighting".

Then as long as we remember that we are dealing with an $(\frac{1}{\gamma})^n$ weighting, we should be able to carry through the Fourier analysis.

Let us examine more closely the FT with exponential time weighting

$$\underline{(\frac{1}{\gamma})^n}$$

$\Rightarrow$ The DTFT is

* Z transform

subject : discrete-time signals $x[n]$
that may "blow-up".

Formula:

Compare to DTFT

* It is as if we attenuate
$x[n]$ by $\boxed{}$ & then
perform DTFT & evaluate it
at $\boxed{}$