ELEC 320
R. Kozick

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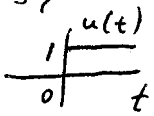
LAPLACE TRANSFORM INTRODUCTION

Signals in table multiplied by $u(t)$



Consider time signals $x(t)$ that equal zero for $t<0$.

Why? Because the Laplace transform helps us to understand and design <u>systems</u>, and systems are "turned on" at some time.

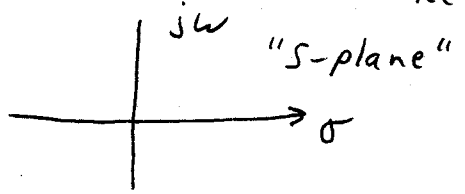
(Fourier transform is primarily for <u>signal</u> analysis and design.)

"One-sided" Laplace transform of $x(t)$:

$$X(s) = \int_0^\infty x(t)\, e^{-st}\, dt$$

What is s? $s = \sigma + j\omega$ is a complex number.

σ: $Re(s)$ $\quad$ $j\omega$: $Im(s)$



We will often look at the "s-plane".

Notation: $\quad x(t) \leftrightarrow X(s)$

$$X(s) = \mathcal{L}\{x(t)\}$$

$$x(t) = \mathcal{L}^{-1}\{X(s)\}$$

(We'll do inverse Laplace transform next class.)

Recall Fourier transform:

$$X(\omega) = \int_{-\infty}^{\infty} x(t)\, e^{-j\omega t}\, dt$$

= Laplace transform along imaginary axis $s = j\omega$.

Compute some Laplace transforms:

$\mathcal{L}\{\delta(t)\} =$

$\mathcal{L}\{u(t)\} =$

"Region of convergence" (ROC) =

$\mathcal{L}\{e^{-2t}u(t)\} =$

R.O.C. =

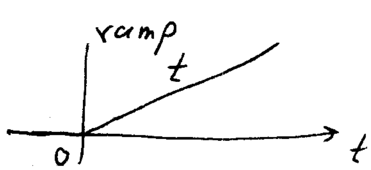
See tables inside back cover of text for more Laplace transform pairs.

We also have Laplace transform <u>properties</u> to extend the table to other signals.

Other transforms to compute:

$\mathcal{L}\{\cos 10t \cdot u(t)\} =$

$\mathcal{L}\Big\{$  $\Big\} =$

$\mathcal{L}\Big\{$  $\Big\} =$