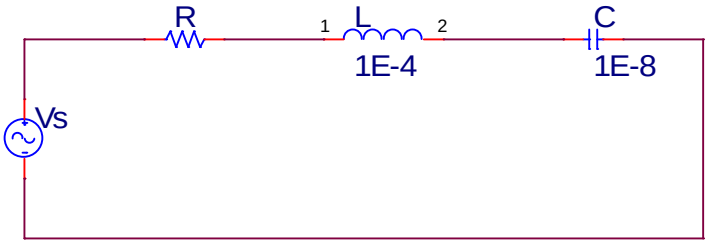
Questions:
What are some important Laplace transforms?
What is a transfer function?
What are poles?
What are zeros?
Why is the left half plane significant?

Review RLC series circuit: 2nd order differential equations

1)

RLC series circuits



In the above circuit, the voltage source is $Vs = \begin{cases} 5V & t < 0 \\ 10V & 0 < t \end{cases}$

a. For what range of resistor values is the circuit overdamped?

b. For what resistor value is the circuit critically damped?

c. For what range of resistor values is the circuit underdamped?

Determine the voltage across the capacitor as a function of time, Vc(t), when

d. R=2000Ω

e. R=200Ω

f. (Team Assignment) R=20Ω

2) Find the Laplace transform of the following function

$$f(t) = (5\cdot\exp(-5t) - 10t\cdot\exp(-5t) + 10)u(t)$$

3). $$F(s) = \frac{2s+1}{s^3+6s^2+8s}$$

a. Find the poles and zeros.

b. Draw the pole zero diagram.

c. Using partial fraction expansion find f(t) including values for all A coefficients

4) $$F(s) = \frac{s+1}{(s+4)\cdot(s+3)\cdot(s+2)}$$

a. Find the poles and zeros.

b. Draw the pole zero diagram.

c. Using partial fraction expansion find f(t) including values for all A coefficients

LAPLACE TRANSFORMS

Signal	f(t)	F(s)
Impulse	$\delta(t)$	1
Step	$u(t)$	$\frac{1}{s}$
Constant	$Au(t)$	$\frac{A}{s}$
Ramp	$tu(t)$	$\frac{1}{s^2}$

LAPLACE TRANSFORMS

Signal	f(t)	F(s)
Exponential	$e^{-\alpha t}u(t)$	$\frac{1}{s+\alpha}$
Damped Ramp	$[te^{-\alpha t}]u(t)$	$\frac{1}{(s+\alpha)^2}$
Cosine Wave	$[\cos\beta t]u(t)$	$\frac{s}{s^2+\beta^2}$
Damped Cosine	$[e^{-\alpha t}\cos\beta t]u(t)$	$\frac{s+\alpha}{(s+\alpha)^2+\beta^2}$

LAPLACE TRANSFORMS

Time Domain	s-Domain
$Af_1(t)+Bf_2(t)$	$AF_1(s)+BF_2(s)$
$\int_0^t f(\tau)\,d\tau$	$\frac{F(s)}{s}$
$\frac{df(t)}{dt}$	$sF(s)-f(0^-)$
$e^{-\alpha t}f(t)$	$F(s+\alpha)$
$t\,f(t)$	$-dF(s)/ds$
$f(t-a)u(t-a)$	$e^{-as}F(s)$