

Preparing for the Third Exam

Roughly a third of the test will be on solving nonhomogeneous problems without using Laplace transforms (i.e., using the “method of guess” and “variation of parameters” — chapters 21 and 23 of the text). The rest will be on everything we’ve covered on Laplace transforms, up through the discussion of the linearity of inverse transforms discussed Monday, November 12 (most of chapters 24 and 25 of the text, along with up through example 26.4 in chapter 26). For details, look at the assigned homework from Wednesday 10/24 through Monday 11/12.

You will be given the same two tables of transforms and identities as handed out in class (and available at our web site).

In particular:

- ◆ Be able to find particular solutions to relatively simple nonhomogeneous equations using the “method of undetermined coefficients” (aka: “method of educated guess”). I am likely to ask you to give me the “appropriate guesses” (without determining the coefficients) for one to four nonhomogeneous equations. Know when the “appropriate guess” is NOT the “first guess” but is either the “second guess” or the “third guess”.
- ◆ Be able to set up and solve the system of equations for u' and v' in the variation of parameters method for solving nonhomogeneous equations. And, of course, know how to construct the general solution to the d.e. from these.
- ◆ Be able to compute a Laplace transform using the basic integral definition.
- ◆ Expect the following problem (IT WILL BE GIVEN!):

*Using the basic definition, prove/derive any **one** of the following two identities (your choice, but **CIRCLE YOUR CHOICE!**). You may assume $F(s) = \mathcal{L}[f(t)]|_s$, a is a real number, and that the function(s) are all continuous, differentiable, “of exponential order”, and everything vanishes at infinity.*

Then will follow a list of just two of the following three identities:

$$\mathcal{L}[e^{at} f(t)]|_s = F(s - a)$$

$$\mathcal{L}[f'(t)]|_s = sF(s) - f(0)$$

$$\mathcal{L}[t f(t)]|_s = -\frac{dF}{ds}$$

Naturally, if you just learn how to derive one of these identities, that will be the one NOT listed on the test!

- ◆ Expect to compute several Laplace transforms and inverse Laplace transforms using the tables. For the most part, you will NOT be told which identity is appropriate for a particular problem. Be good at recognizing which identities are appropriate, and at using them!
- ◆ Expect one or two “simple” initial-value problems to be solved using the Laplace transform.
- ◆ On this test, none of the problems will require the use of partial fractions. .