Review for third exam

The third exam covers the material from Assignments 8, 9, and 10, corresponding to sections 7.4, 7.5, 7.6, 8.1, 9.1, and 9.2 of the text. (Of course, to understand the material in sections 7.4 through 7.6, you have to be familiar with the material in sections 7.1 through 7.3 as well. This might be a good time to look at the review sheet for the second exam again.)

Although we've talked about sections 9.3 and 9.4 in class for the past couple of lectures, these sections will not be covered on the third exam.

Section 7.4: You should be familiar with the definition of the convolution of two functions (page 475); the convolution property (Theorem 1 on page 475); the theorem on differentation of Laplace transforms on the s side (Theorem 2 on page 476, compare with the theorem on page 453 about differentiation on the t side); and the theorem on integration of Laplace transforms on the s side (Theorem 3 on page 478, compare with the theorem on page 460 about integration on the t side). These three formulas will be on the formula sheet I hand out with the exam.

You should review the examples from this section. Also, problems 29 through 34 are useful for review. A entire one of such problems would be too long for the exam, but if you can do one of those problems you are likely to do any problem that comes up on the exam.

Section 7.5: You should review Theorem 1, Examples 1 to 4, Theorem 2, and Examples 6 and 8. The formulas from Theorems 1 and 2 will also be on the formula sheet handed out at the exam.

Section 7.6: You do not need to know exactly what the delta function $\delta_a(t)$ is; you can just think of it as a function which looks like the one in Figure 7.6.1, with a very small ϵ. That is, $\delta_a(t)$ is, roughly speaking, a function which is zero everywhere except for t between, say a and $a + .001$, where it is equal to 1000. Thus the area under the graph of the delta function is 1. An important property of the delta function $\delta_a(t)$ is that when you multiply it by $f(t)$ and integrate over any interval containing a, the result is $f(a)$. That is,

$$\int_p^q \delta_a(t)f(t)\ dt = f(a)$$

whenever $[p, q]$ is an interval containing a.

The formula concerning the delta function that you most probably will have occasion to use is

$$\mathcal{L}(\delta_a(t)) = e^{-as},$$

valid when $a \geq 0$. This is formula (11) in Section 7.6, it will also appear on the formula sheet you get at the exam. In particular, when $a = 0$, instead of $\delta_0(t)$ we often write just $\delta(t)$. So

$$\mathcal{L}(\delta(t)) = 1.$$

Section 8.1: For the test, the only thing you might need to know from this section is how to do a problem similar to the one from this section on Assignment 9 (problem 4).

Section 9.1: You should know the definition of periodic function on page 581. I should have emphasized it more in class, to make sure everyone understands what exactly a periodic function is.

You should know that the Fourier series expansion of a function of period 2π is given by the expression in formula (18) on page 584, with constants a_n and b_n given by formulas (16) and (17) on page 584. Later, on page 590 in section 9.2, similar formulas are given for the Fourier series expansion of a function of period $2L$, where L is any positive number. I recommend memorizing these formulas. Actually, you only need to memorize the formulas on page 590, because the formulas on page 584 are the same as on page 590, except with L replaced by π.

You should closely study Examples 1 and 2 from this section, and be ready to do similar examples yourself.

Section 9.2: As mentioned above, you should know the formulas in the definition in the blue box on page 590.

Study Examples 1 and 2 carefully.

You should be familiar with the theorem on page 592. It says that if a function f is "well-behaved" enough (piecewise smooth), then the Fourier series for f actually converges to the $f(t)$ at points t where f is continuous; and the Fourier series converges to the average of the left and right limits of f at t, at points where f has jumps.