Review for final exam

The final exam is comprehensive. To prepare for it, you can review the material covered on the review sheets for the first three exams, together with the material we've covered in sections 9.3, 9.4, and 9.5.

Section 9.3: Read the material from the beginning of the section through Example 1 on page 601. You can skip the remainder of the section (on termwise differentiation and integration of Fourier series).

Make sure you're clear on what even and odd functions are. In particular, you should understand how to get the graphs in Figure 9.3.3 by taking even or odd periodic extensions of the original function, graphed in blue, on $0 < t < 2$.

If $f(t)$ is defined for $0 < t < L$, the Fourier series of the even period-$2L$ extension of f has only cosines in it, and the Fourier series of the odd period-$2L$ extension has only sines in it. These are called the Fourier cosine series and the Fourier sine series of the original function, and they both converge to the same original function $f(t)$ (or to the average of its values at a jump), even though they are completely different series. An instructive example in the book is given by the function $f(t) = t$. The Fourier cosine series is given by (15) on page 601, and the Fourier sine series is given by (16) on 601. These both add up to t at all values of t strictly between 0 and 2, but they differ at $t = 2$. The Fourier cosine series in (15) converges to the function shown in Figure 9.3.4, and the Fourier sine series in (16) converges to the function shown in Figure 9.3.5. Notice they both converge to $f(t) = t$ (whose graph is a diagonal line at a 45 degree angle to the t-axis) at all points t in $(0, 2)$.

Section 9.4: Read from the beginning of the section through Example 3. You can skip pages 613 and 614.

Section 9.5: There might be a problem on the final like the ones in Examples 1 and 2 of this section.

The solutions found in this section will make more sense, and be easier to remember, if you understand the method by which they were found, described on pages 620 and 621. We went through this in class, except we did not go through the derivation of the numbers λ_n in equation (23) and the functions X_n in equation (24). To see where those came from, you can look at Example 3 on page 234. I will not expect you to know this material for the final exam. But if you have anything to do with differential equations in the future, this will be a very important example. So if you don't have anything better to do, read through it! You can also find a fairly straightforward explanation of the method online at

`http://www-solar.mcs.st-and.ac.uk/~alan/MT2003/PDE/node21.html`