Multiple-page homework must be STAPLED when handed in.

Turn in starred problems Tuesday 11/13/2007.

Section 17.3: 4 (g), 16 (b)*, 18 (c)*

Section 17.4: 1 (b), 2 (c)* (d)* (see Comment 2 below!)

Section 18.3: 6 (c), (h)*

Several students asked in class about the Fourier expansion of a delta function. Here is an **extra credit** problem on this question (but probably not enough extra credit to make it worth doing unless you are interested). If you do this problem please **hand it in on a separate piece of paper** so that it can be graded separately from the regular assignment.

10.A (a) Let $F(x)$ be defined on $(-1, 1]$ by $F(x) = \delta(x)$, and then defined for all x as a function of period 2. Compute **formally** the Fourier series of $F(x)$. Don't worry about convergence.

(b) Use Maple or another program to construct a plot, over the interval $[-3, 3]$, of four partial sums of the series you found in (a): the constant term in the series, the sum of the first two terms (including the constant), the sum of the first four terms, and the sum of the first twenty terms. Does it appear that the Fourier series is in some sense converging to $F(x)$?

(c) Solve problem 17.3:18 with $F(x)$ the function defined in (a) above. (Your intermediate steps will be of questionable validity, since $F(x)$ is not really a function, but the solution will be the correct response of the undamped oscillator forced with a periodic succession of impulses.)

Comments, hints, instructions: 1. In 17.3:16(b) it will be helpful to note that the integrals in (60) and (61) can be taken from 0 to 2ℓ rather than from $-\ell$ to ℓ, since all the functions have period 2ℓ.

2. For 17.4:2(d), do only the part of the problem requiring the sketches; you are *not* required to compute the series for (d). For 17.4:2(c) do the entire problem.

3. Section 18.3: We have not covered all of this section, but in lecture Thursday 11/8 we discussed using Fourier series in solving the one-dimensional diffusion equation on an finite interval with homogeneous boundary conditions. The two problems assigned are of this type. In approaching such a problem you must first decide what sort of series to use: half range? quarter range? sine? cosine?