******* Comments about the final exam 18.303 *******

- The final will be divided "roughly" as follows:
    - Part 1. worth 60% - questions testing basic knowledge of the course
    - Part 2. worth 20% - a little tougher
    - Part 3. worth 20% - will require some thought
- As usual, a portion of the marks goes to being clear and concise. I don't want to have to try and figure out what you're doing.

- For instance, I'd consider some of the simple symmetry questions for part 2, and the harder symmetry questions to be part 3.

- I'll give you LESS help with intermediate steps, like I did on Test 2.

- In general, I want you to know methods rather than memorizing formulae. I will give you any complicated integrals, and things like the Jacobian and the definition of the error function erf(x). I expect you to know how to use these. I expect you to know methods, like separation of variables, method of characteristics, method of parametric solution of quasi-linear PDEs (steps are really those in Test 2 - know these), method of Fourier Transform and Convolution Theorem (statement only, NOT proof), and how to use these to solve the heat and Laplace equation. I'd give you the integrals here (e.g. integral of a Gaussian) - but you have to know the definitions of the Fourier Transform and Inverse Fourier Transform, so you can use what I give you.

- e.g. know the basic formula for the heat kernel, i.e. an integral in terms of K(s,x,t) and f(s), but you don't have to memorize the particular K(s,x,t). I'll give that to you - I could ask you to derive it, so know where it comes from. I could also ask you to use it and write a solution down for a particular f(s).

- I want you to know things including, but not limited to,

    - the statement of the maximum principle and the mean value property (do NOT need to know proof!)

    - showing that the eigenfunctions corresponding to different eigenvalues are orthogonal (section 6 in pde3d.pdf)

    - showing that the eigenvalues are real and positive (section 3.2 in pde3d.pdf)

    - uniqueness proofs - we had several examples in the notes (1D and multi-D) and in the problem sets - these generally all proceed the same way

- the Ratio Test and how to apply it to show absolute convergence (yes, know what absolute convergence means too) of a series of numbers (for part 2, 3 of exam)

- the Weirstrass M-Test and how to apply it to show uniform convergence of a power series (don't have to know definition for uniform convergence) (for part 2, 3 of exam)

- separation of variables on a disc - I will give you the form of the Laplacian and also Bessel's equation with solution. You just have to know how to do the work in between, and that what to do to with the solution to Bessel's equation.

- D'Alembert's solution to the wave equation: u(x,t) = (1/2) * (f(x-ct) + f(x+ct) + Int(g(s) from x-ct to x+ct)). I'd still probably have to help you out with regions, but still try and know all the steps to solving for u(x,t) given f(x) and g(x).

- you are NOT responsible for:
-- any part of section 13 and 13.1 (Rayleigh quotient etc) in pde3d.pdf
-- shock propagation - just know how to find when and where they occur
-- section 15 in pde3d.pdf (steady-state temp in cylinder)

******* End Comments about the final exam 18.303 *******