Homework 1 - Math 133
Due Thursday, Jan. 22

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Office hours: Friday 1pm-3pm.

www.math.duke.edu/~mauro/teaching.html

I prefer homework written in pen rather than pencil. The handwriting and organization of your work on the page should be clear. Include appropriate explanations for what you are doing in your calculations and why, and what conclusions you draw or observations you make.

The homework should include a printout of the Matlab code you used and of the Matlab output (including figures). Also send me a copy of the Matlab code via e-mail: if you have multiple files, compress them into a unique zip file. Name the file as FamilyName_FirstInitial_Homework_xx.zip, where xx is the homework number. This will apply to all the future homework as well.

Solve these initial value problems, and comment on the qualitative behavior of the solutions:

(a) $u_t + 2u_x = 4t\,,\ u(x,0) = \sin(x/3)$

(b) $u_t + 3u_x = x\,,\ u(x,0) = \cos(x)$

(c) $u_t + 4xu_x = x\,,\ u(x,0) = \sin(x)$

(d) $u_t + 2txu_x = 0\,,\ u(x,0) = f(x)$

Do problems 1,2,3 on page 27 (note that on page 501 there are partial solutions and hints for these problems).

Do all parts of problem 5 on pages 28-29. You will use Matlab in this problem to explore the solutions. Use a fine resolution for the variable x (such as 0.001), and use the zoom feature to explore the solution and estimate the peak. The command grid on will display a grid in the current axes, which may help the task.