AMath 574
Homework 1
Due to Github by 11:00pm on January 15, 2015

Problem #2.1 in the book

Problem #2.3 in the book

Problem #2.4 in the book

Problem #2.5 in the book

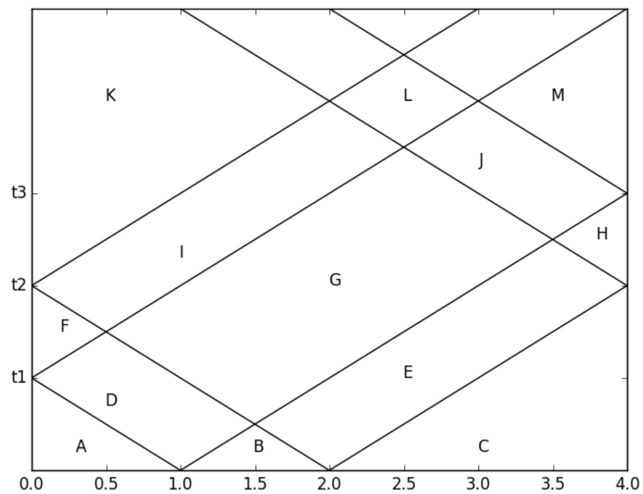
Problem #2.7 in the book

Problem #3.3 in the book

Following the sort of thing done in script `problem_3_5.py` might be useful if you want to insert a figure in your solution, or you can draw with another programming language, or sketch the solution by hand and scan.

Problem #3.5 in the book

The script `problem_3_5.py` was used to generate this figure:



To solve this problem, determine the states $A,\ B,\ \ldots,\ M$ and also the times $t_1,\ t_2,\ t_3$. The times can be written in terms of the parameters ρ_0 and K_0, which were not stated in the problem.

For example,

$$A = \begin{bmatrix} 0 \\ 0 \end{bmatrix}, \quad ,B = \begin{bmatrix} 1 \\ 0 \end{bmatrix}, \quad ,C = \begin{bmatrix} 0 \\ 0 \end{bmatrix}, \quad \ldots$$

Problem #3.5A Solve #3.5 with *periodic* boundary conditions instead of reflecting walls. Sketch the solution in the x–t plane up to at least time t_3 (as in #3.5 the time the right-going wave from $x_0 = 1$ hits the right boundary) and indicate the state in each section. You might want to modify the script `problem_3_5.py` to make the plot.

Optional

For more practice with simple Riemann problems you might want to work through Problem 3.1 and perhaps tackle 3.2. If you want to try writing a program in Python, the module `numpy.linalg` contains an `eig` function similar to Matlab.