Numerical Relativity - PHY 6938

HW 8

Hand in this homework.

READ: Chap 5. & 6.

PROBLEMS:

1. Last time you studied and ran the python program `advection1.py`.
a) `advection1.py` contains 3 functions to take spatial derivatives, namely `Dm`, `Dp`, `D0`. Try all 3 in `eval_rhs`. Which one works best and why? Hint: think about boundary conditions. In order to see what happens install tgraph
(see `github.com/wofti/tgraph`) and look at your output by typing
`python advection1.py > f1.dat`
`tgraph.py f1.dat`
NOTE: tgraph needs additional python packages, such as matplotlib, (and maybe tkinter and tkinter.ttk), which you may have to install. Ask me if there is a problem.
b) On which side of the grid should we impose a boundary condition?
c) What boundary condition do we need to impose so that the solution becomes $u(t, x) = \sin(x - t)$.
d) Add a function `set_BC` to the program that is called after the line
`u = calc_unew(u, rhs, dt)`
and that imposes the boundary condition from c). Print your program and your resulting u at $t = 1$ (e.g. by using tgraph) and attach it to your homework.