Numerical Relativity - PHY 6938

$\mathrm{HW}\ 7$

Hand in this homework.

READ: Chap 5.

PROBLEMS:

1. It's time to do some numerics. Here we use Python

(see e.g. https://docs.python.org/3/tutorial/index.html) because it's so simple that for what we do, you do not even need to have prior knowledge of this language. If you like C, you could easily translate what we do into C.

a) Install python on your computer. (Note that serious computing is done on Linux.) On a Debian based Linux system you can type:

apt-get install python-is-python3

Installing additional packages like numpy (used here) is just as easy:

apt-get install python3-numpy

If you are in the unfortunate situation of being stuck with Windows you can google, download and install a complete package collection such as WinPython. It also has a command line that works (to some degree).

Once you got that done you can start a program such as advection1.py by typing python advection1.py

b) Download and study the program advection1.py from the class website. What partial differential equation are we trying to solve? Which grid points x_i are we using? (Note: in Python one writes x[i] for x_i .)

c) Run advection1.py. What is the last non-empty line it prints and what do these 2 numbers mean?

NOTE:

You can redirect the output of advection1.py into a file by typing:

python advection1.py > f.txt

If you are curious, you can then use e.g. tgraph

(see github.com/wofti/tgraph) to look at your output by typing:

tgraph.py f.txt

Note2: tgraph needs the python package matplotlib, which on Debian you install with: apt-get install python3-matplotlib