PHYS 240 homework #17 – due Apr 5 2013, 5:00pm, upload to Canvas

Diffusion equation

1. Consider again the diffusion equation problem that we covered in class. Suppose that we replace our Dirichlet (fixed-value) boundary conditions with the following Neumann (fixed-derivative) boundary conditions:

$$\left.\frac{\partial T}{\partial x}\right|_{x=-L/2} = \left.\frac{\partial T}{\partial x}\right|_{x=L/2} = 0$$

Modify `dftcs.py` to implement these boundary conditions by setting $T_1^n = T_2^n$ and $T_N^n = T_{N-1}^n$. Also change the initial conditions to $T(x,0) = \delta(x - L/4)$. Explain why the spatial discretization is $x_i = (i - \frac{1}{2})h - L/2$ with $h = L/(N-2)$ for these boundary conditions. Plot and discuss your results.

2. Include any discussion and plots in a report generated in LaTeX and submitted in PDF format. Also submit your Python code separately.