PROGRAMMING ASSIGNMENT 8:
HEAT FLOW

- Write a program to solve the $1 + 1$ D heat (diffusion) equation using the FTCS (forward-time, centered-space) method for heat flow in a rod which is initially heated in the center and has heat sinks on either end. Use an array of dimension 2 in your code.
  - Use boundary conditions $T_1^n = T_N^n = 0$ (where the lower index is spatial and 1 and N represent the ends of the rod) – these are the heat sinks.
  - For initial temperatures, set $T_i^1 = 0$ for all $i \neq N/2$ and $T_{N/2}^1 = 1/h$ (this sets all points to zero initially except the center which is large).
  - For numerical parameters use $N = 61$ (spatial gridpoints), $L = 1.0$ (length of rod), $\kappa = 1.0$ (diffusion constant), and $\tau = 0.0001$ (timestep).
- Generate a surface plot of every point on the rod as a function of time. One way to do this is to write the temperature at every point on the rod at a given timestep out to file:

  do j = 1, n_t_steps
  write (unit,*) T(j,:) (! This writes every column in the j'th row to the file)
  end do
- Then you can: "splot 'filename' matrix with lines" in gnuplot to get a surface plot.