

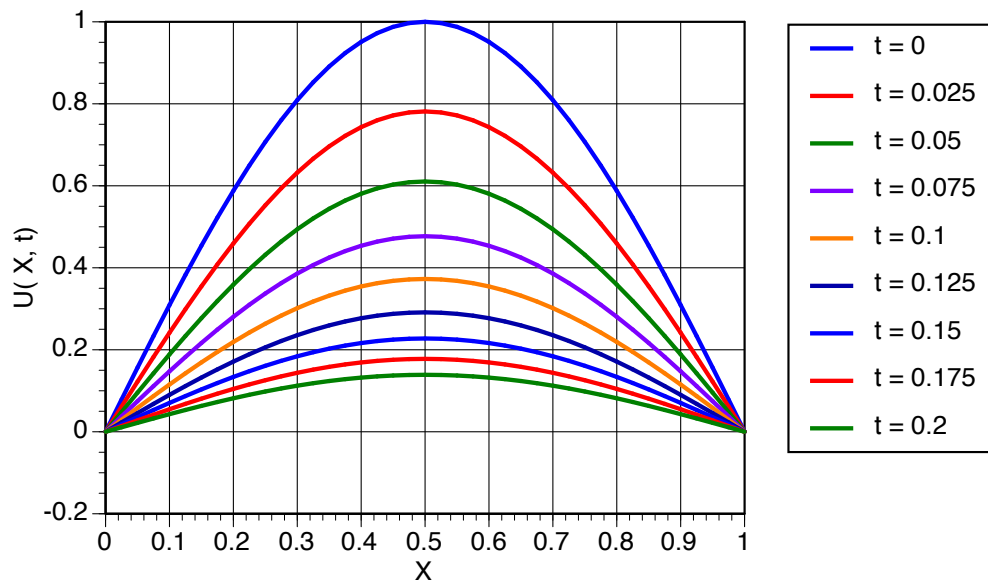
For the first part of the numerical project, the initial and boundary conditions are:

$$(a) \quad T(x,0) = \sin(\pi x), \quad T(0,t) = T(1,t) = 0;$$

The analytical solution is

$$T(x,t) = e^{-\pi^2 t} \sin(\pi x)$$

A plot of the analytical solution is shown below:



Numerical procedure:

Fix the desired spatial resolution  $\Delta x$

Set the time step such that the stability condition for FTCS is met

The number of grid points is then  $N = 1 + (1/\Delta x)$

Set the initial  $t = 0$  value of  $U$  at each grid point (initial conditions)

In this case the values are  $U(1,t)$  and  $U(N,t)$  are to be kept fixed.

Set the time interval (number of time steps) at which you want to store the temperature distributions.

Enter the calculation loop

Advance the values of  $U$  in time at each of the internal points by sweeping from left to right.

Repeat until the desired final time.