Numerical Project Part b

Initial condition: $T(x,0) = 1$ (uniform temperature in the bar at t = 0)

Boundary conditions: $T(0,t) = 0$ Fixed temperature at left boundary

$\frac{\partial T}{\partial x}(1,t) = 0$ Right boundary is insulated

Analytical solution:

$$T(x,t) = \sum_{n=1}^{\infty} \frac{4}{\pi(2n-1)} e^{-\left(\frac{2n-1}{2}\pi\right)^2 t} \sin\left(\frac{2n-1}{2}\pi x\right)$$

You will approach this problem in a manner very similar to that used in part a. The exception is that the temperature at the right boundary now becomes a function of time in order to maintain the zero-derivative end condition. You should use the following relation which we derived in class:

$$U_N = \frac{4}{3} U_{N-1} - \frac{1}{3} U_{N-2}$$

My recommendation is to take a working code from part (a) and (1) modify the intial condition and (2) add the above relation for U_N in the main calculation loop.