



Quiz #13

Student Name:

Student ID:

1. Use the simple implicit finite-difference approximation to solve the temperature distribution of a long, thin rod with a length of 10 cm and the following values: $k' = 0.49 \text{ cal/(s} \cdot \text{cm} \cdot ^\circ\text{C)}$, $\Delta x = 2 \text{ cm}$, and $\Delta t = 0.1 \text{ s}$. At $t = 0$, the temperature of the rod is zero and the boundary conditions are fixed for all times at $T(0) = 100^\circ\text{C}$ and $T(10) = 0^\circ\text{C}$. Note that the rod is aluminum with $C = 0.2174 \text{ cal/(g} \cdot ^\circ\text{C)}$ and $\rho = 2.7 \text{ g/cm}^3$. Therefore, $k = 0.49 / (2.7 \cdot 0.2174) = 0.835 \text{ cm}^2/\text{s}$ and $\lambda = 0.835(0.1) / (2)^2 = 0.020875$.