1. Solve the governing equation dealing with the heat transfer phenomena in a heated rod using the FINITE DIFFERENCE Method.

   $\frac{d^2T}{dx^2} = -h'(T_\infty - T)$ using the boundary conditions: $T(0) = T_a$ and $T(L) = T_b$. Use the following parameters: L = 10 m, $h' = 0.05\ m^{-2},\ T_\infty = 200\ K,\ and\ the\ boundary\ conditions$:

$$T(0) = 300\ K\ and\ T(10) = 400\ K.$$

2. The heat transfer problems dealing with the radiation phenomena face nonlinear boundary conditions. Use the SHOOTING method to solve the governing equation: $\frac{d^2T}{dx^2} = -h'(T_\infty - T) - \sigma'\ (T_\infty^4 - T^4)$, where $\sigma'$ = a bulk heat transfer parameter reflecting the relative impacts of radiation and conduction = $2.7 \times 10^{-9} K^{-3} m^{-2}$ . This equation can serve to illustrate how the Finite – Difference Method is used to solve a two-point boundary value problem. The remaining problem conditions are as follows: L = 10 m, $h' = 0.05\ m^{-2}$ , $T_\infty = 200\ K,$ T(0) $= 300\ K$ and T(10) = 400 K.

3. The governing differential equation for a hot rod under steady - state can be expressed: $\frac{d^2T}{dx^2} = 0.15\ T$ . Obtain a solution for a 10 m rod, T(0) $= 240\ K$ and T(10) = 150 K using the following methods.

(a) Analytically,

(b) The shooting Method,

(c) The Finite - Difference Method with $\Delta x = 1$.