CAPE Laboratory

Spring Semester 2024 - 2025

Assignment – 4

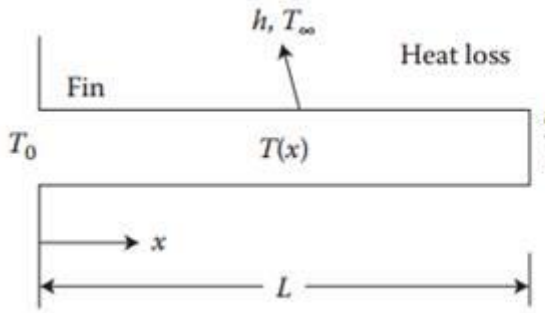
Objective: Numerical solution of Ordinary Differential Equation: Boundary Value Problem

Consider the steady-state heat transfer in a fin of uniform cross-section as shown below. The thermophysical properties of the fin material are constant. Find the temperature along the length of the fin $T(x)$ using

(a) Finite Difference Method (write your own code)

(b) Shooting Method (write your own code)

(c) MATLAB function `bvp4c`



The following BVP represents the governing equation for the fin.

$$\frac{d^2T}{dx^2} - \beta(T - T_\infty) = 0,\ T(x = 0) = T_0, T(x = L) = T_L$$

Given: $T_0 = 100$, $T_L = 30$, $T_\infty = 30$, $L = 2$, $\beta = 1.5$ (in appropriate units)