

INTRODUCTION TO THE FINITE ELEMENT METHOD

Department of Mechanical Engineering

National Taiwan University

Fall 2019

HOMEWORK #1

Due Sep. 26, 2019

1. Use the finite-difference approach to determine the temperature distribution of a heated rod. Use four interior nodes with a segment length of $\Delta x = 2$ m, and compare the results with the analytical solution.

Governing equation:
$$\frac{d^2T}{dx^2} + \frac{2h}{rk}(T_\infty - T) = 0$$

Given: $h = 1 \text{ J}/(\text{m}^2 \cdot \text{K} \cdot \text{s})$, $r = 0.2 \text{ m}$, $k = 200 \text{ J}/(\text{s} \cdot \text{m} \cdot \text{K})$, $L = 10 \text{ m}$, $T_\infty = 200 \text{ K}$, $T(0) = 300 \text{ K}$, $T(10) = 400 \text{ K}$.

