

The purpose of this assignment is to construct model problems related to heat conduction that illustrate several concepts discussed in class. For problems 2 to 4 you are asked to construct model problems different from those provided in the notes or in class.

1. Provide a written summary of the relevant theory. Be sure to include definitions of terms.

2. Provide (i) the data to problems that provide smooth solutions (of class C^∞) and (ii) the solutions (if they exist) that illustrate

- (a) two well posed problems, one with Dirichlet and one with mixed boundary conditions, and
- (b) an ill-posed problem. Show explicitly why it is ill-posed.

3. Provide the data and the solution for a problem where the solution is strong but not of class C^2 .

4. Provide the data and the solution for a problem where the solution is weak.

5. Provide one set of boundary conditions and the forcing function consistent with a manufactured solution of your choice for which the conductivity is given by

$$K^A(x) = K_\theta^A + (K_l^A - K_\theta^A)H[x - a] + K_2^A \sin\left(\frac{\pi x}{2L}\right)$$

K_θ^A , K_l^A and K_2^A - constants

Sketch K^A and Q as functions of x .