

## Chapter 2:

# Concept Review Questions

- 2.1** Consider steady-state heat conduction in a semi-infinite plate or slab of thickness  $L$ , a very long hollow cylinder, and a hollow sphere of inner radius  $r_i$  and outer radius  $r_o$ . Assuming uniform conductivity  $k$  in the plate, write the conduction equation and express the respective thermal resistance for each of the three geometries.
- 2.2** What is the primary purpose of adding fins to a heat transfer surface? Consider a plate separating two fluids, A and B, with respective convection heat transfer coefficients  $\bar{h}_{cA}$  and  $\bar{h}_{cB}$  such that  $\bar{h}_{cA} \gg \bar{h}_{cB}$ . To what side of the plate surface should fins be added and why? In choosing the size of these fins, would you make them as long as the available space would permit? Why or why not?
- 2.3** Define the Biot number and briefly explain its physical interpretation. What would be the primary difference between transient heat conduction from a solid to a convective environment when (a) Bi is very small and (b) Bi is large? What value of Bi is generally taken to separate the two regimes in engineering practice?
- 2.4** When a cold can of soda is left on a table it warms up. Briefly describe the modes of heat transfer involved in this process and outline how you would model the problem.