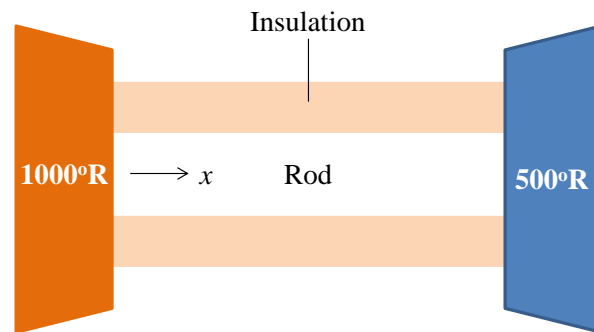**1.46** Figure 1.46 shows a system consisting of a cylindrical copper rod insulated on its lateral surface while its ends are in contact with hot and cold walls at temperatures 1000°R and 500°R, respectively.
(a) Sketch the variation of temperature with position through the rod, x.
(b) Is the rod in equilibrium? Explain.

KNOWN: The ends of a copper rod insulated on its lateral surface are in contact with hot and cold walls.
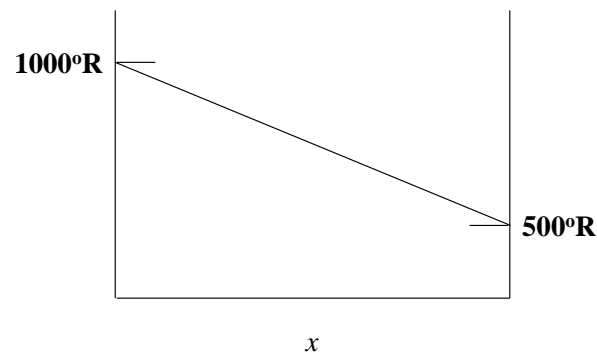
FIND: (a) Sketch the variation of temperature with position through the rod, x, and (b) Indicate whether the rod is in equilibrium and explain.

SCHEMATIC AND GIVEN DATA:

ANALYSIS:
(a) The variation of temperature with position through the rod is

(b) Apply the test for equilibrium given in Sec. 1.3.4 -- namely, think of isolating the system and watching for changes in observable properties. In this instance, the rod is the system and the relevant observable is its temperature. If the rod is also insulated on its ends, its temperature will eventually become uniform throughout, indicating that the rod was not in equilibrium initially.