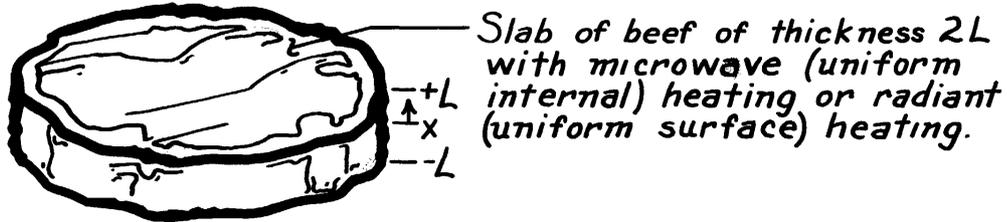


### PROBLEM 5.3

**KNOWN:** Microwave and radiant heating conditions for a slab of beef.

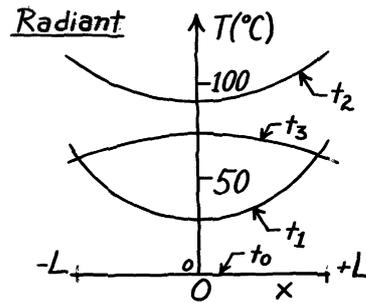
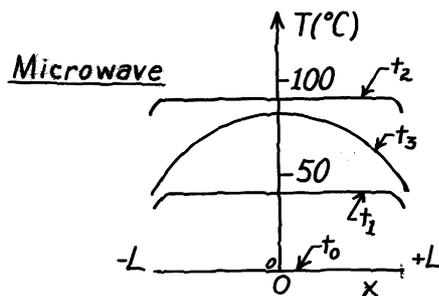
**FIND:** Sketch temperature distributions at specific times during heating and cooling.

**SCHEMATIC:**



**ASSUMPTIONS:** (1) One-dimensional conduction in  $x$ , (2) Uniform internal heat generation for microwave, (3) Uniform surface heating for radiant oven, (4) Heat loss from surface of meat to surroundings is negligible during the heating process, (5) Symmetry about midplane.

**ANALYSIS:**



**COMMENTS:** (1) With uniform generation and negligible surface heat loss, the temperature distribution remains nearly uniform during *microwave heating*. During the subsequent surface cooling, the maximum temperature is at the midplane.

(2) The interior of the meat is heated by conduction from the hotter surfaces during *radiant heating*, and the lowest temperature is at the midplane. The situation is reversed shortly after cooling begins, and the maximum temperature is at the midplane.