

Exercise 6

Two homogeneous rods have the same cross section, specific heat c , and density ρ but different heat conductivities κ_1 and κ_2 and lengths L_1 and L_2 . Let $k_j = \kappa_j/c\rho$ be their diffusion constants. They are welded together so that the temperature u and the heat flux κu_x at the weld are continuous. The left-hand rod has its left end maintained at temperature zero. The right-hand rod has its right end maintained at temperature T degrees.

- (a) Find the *equilibrium* temperature distribution in the composite rod.
- (b) Sketch it as a function of x in case $k_1 = 2$, $k_2 = 1$, $L_1 = 3$, $L_2 = 2$, and $T = 10$. (This exercise requires a lot of elementary algebra, but it's worth it.)