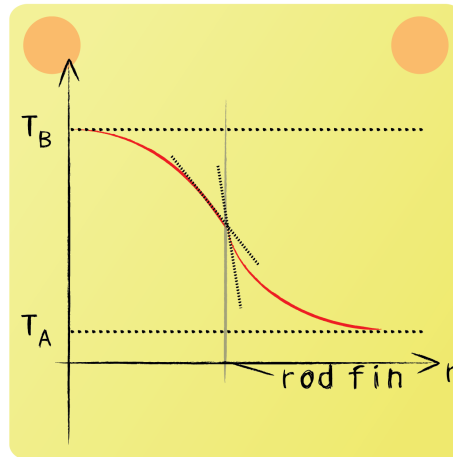




## Lecture 10 Question 5.2

Air flows around a rod-fin with a free-stream temperature of  $T_A$ , while the temperature at the center of the fin is  $T_B$ . Finite heat flux is transferred to the environment and there is no heat source in the fin. Pick the correct temperature profile in the radial direction for  $Bi = 1$ .



Since  $Bi = 1$ , the conductive resistance inside the body is equal to the convective resistance outside. Therefore the decrease in temperature should be of the same order for the in- and outside. At the intersection, the gradient should be steeper outside the body because air has a smaller thermal conductivity. Furthermore, when moving away from the center of the rod-fin, the temperature eventually approaches the ambient temperature with a horizontal slope.