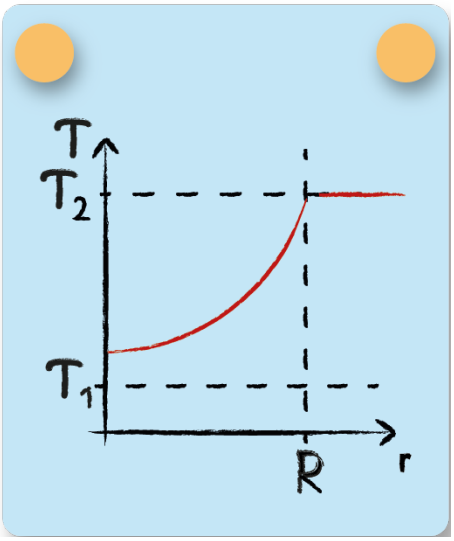
Temperature Profile Transient 1

A sphere with the radius R and initial homogeneous temperature T_1 is suddenly (at time t_0) heated up in a very large basin with a constant basin temperature T_2. At a finite time $t_1 > t_0$ the temperature is already increased everywhere in the sphere. Choose the appropriate radial temperature profile at t_1. Note that $\alpha \to \infty$.



As stated the temperature is already increased everywhere. Because the penetration depth towards the center is the biggest, the temperature will be the lowest in the center. Also, in the center, the gradient will be zero due to symmetry.

When moving from the center in a radial direction the temperature and its slope increase. The increase in slope is caused because most heat has been absorbed in the surface.

At the surface, the temperature is equal to the ambient temperature T_2 due to the fact that $\alpha \to \infty$ and thus the thermal resistance outside the sphere is negligible.