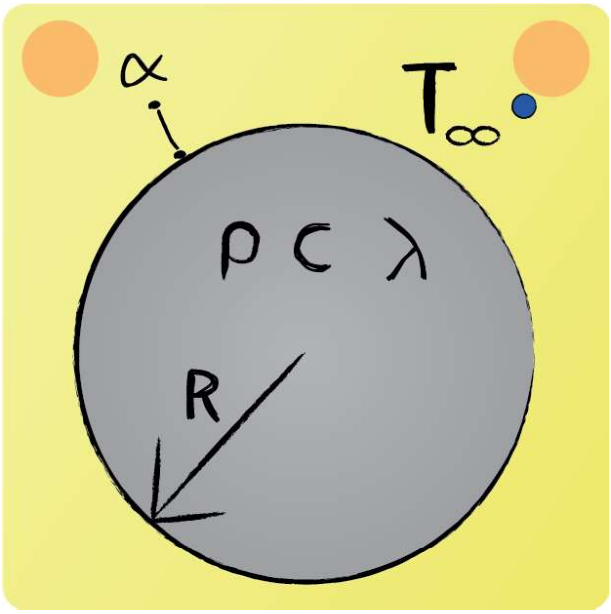
Exam Preparation - Conduction 22

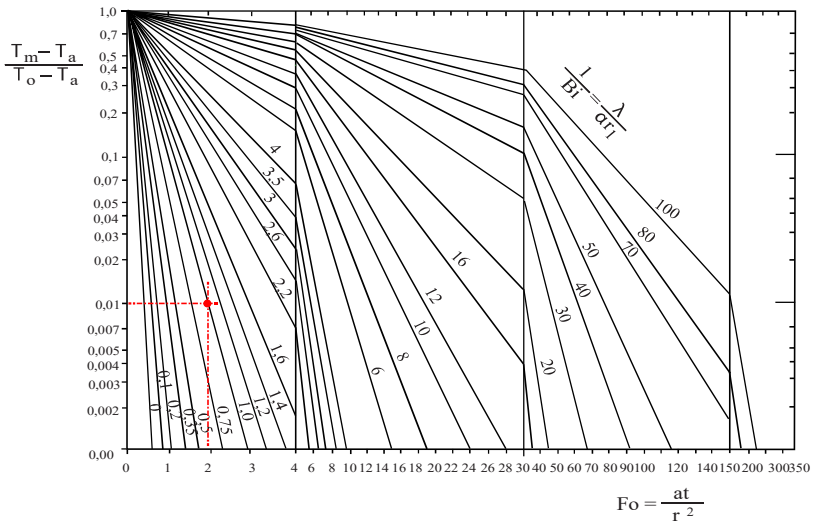


A sphere with radius $R = 1$ cm with initial homogeneous temperature $T(r, t = 0) = 293$ K, is suddenly exposed to a medium of temperature $T_\mathrm{A} = 353$ K. Determine the time t_1 at which $T(r = 0, t_1) = 352.4$ K is reached.

Problem type:
One-dimensional, unsteady-state heat conduction that does penetrate.

$$\frac{1}{\mathrm{Bi}} = \frac{\lambda}{\alpha \cdot r_1} = 1$$

$$\frac{T_\mathrm{m} - T_\mathrm{a}}{T_\mathrm{o} - T_\mathrm{a}} = 0.01$$



$$\rightarrow \mathrm{Fo} = 1.92$$

$$t = 1675.65 \text{ s}$$