BRIEF ARTICLE

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Consider steady ($\partial/\partial t = 0$) conduction in a two-dimensional (cartesian x and y) rectangular domain of width $\Delta x = W$ and height $\Delta y = H$, with constant conductivity κ, subject to an isothermal bottom boundary with Temperature $T = T_0$, adiabatic top ($\partial T/\partial y = 0$) and left ($\partial T/\partial x = 0$) walls, and with a right boundary exposed to a fluid at $T = T_\infty$ with constant convection coefficient h. Defining the dimensionless temperature

$$\theta \equiv \frac{T - T_\infty}{T_0 - T\infty},$$

and coordinates $x^* \equiv x/W$ and $y^* \equiv y/W$, we can rewrite the dimensionless problem as shown in the figure below, where the asterisks have dropped for simplicity. In this tutorial, we will adopt the aspect ratio $H^* \equiv H/W = 2$ and Biot number $Bi \equiv hW/\kappa = 5$

Find the dimensionless temperature distribution as well as the dimensionless heat flux using ANSYS Workbench.