1. Solve the following initial-boundary value problem for the Heat Equation

\[ \frac{\partial u}{\partial t} = c^2 \frac{\partial^2 u}{\partial x^2} \quad 0 \leq x \leq 1 \]

\[ \begin{align*}
    u(0,t) &= 0 \\
    u(1,t) - \frac{1}{2} \frac{\partial u}{\partial x}(1,t) &= 0 \\
    u(x,0) &= f(x)
\end{align*} \]

2. Solve the following BVP for the Laplace equation using separation of variables:

\[ \frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0 \quad 0 \leq x \leq a, \quad 0 \leq y \leq b \]

\[ \begin{align*}
    \frac{\partial u}{\partial x}(0,y) &= 0 \\
    u(a,y) &= 0 \\
    u(x,0) &= 1 \\
    u(x,b) &= 1
\end{align*} \]

Hint: Using the separation \( u = X(x)Y(y) \) formulate a SL problem in the variable which involves homogeneous BCs.