Some Notes about Part I

1 Heat Equation

$$
\begin{aligned}
u_t = u_{xx}, 0 \leq x \leq 2\pi, t > 0 \\
u(0,t) = 0 \\
u(2\pi,t) = 0 \\
u(x,0) = x = f(x)
\end{aligned}
\tag{1}
$$

2 Hint for Boundary Condition Function

For problems posed on the interval $a \leq x \leq b$, the boundary conditions apply for all t and either $x = a$ or $x = b$. The standard form for the boundary conditions expected by the solver is

$$p(x,t,u) + q(x,t)f\left(x,t,u,\frac{\partial u}{\partial x}\right) = 0 \tag{2}$$

In MatLab, we define boundary conditions just like equation 1. So for Dirichlet boundary condition $(qr = ql = 0)$, we have:

$$u(0,t) + 0 \cdot f\left(x,t,u,\frac{\partial u}{\partial x}\right) = 0 \tag{3}$$

$$u(2\pi,t) + 0 \cdot f\left(x,t,u,\frac{\partial u}{\partial x}\right) = 0 \tag{4}$$

So boundary condition in xl will be like:

$$ul = 0$$

Just to follow the standard form for the boundary conditions expected by the solver is:

$$pl = p(x = 0, t, u) = ul \tag{5}$$

We repaet this steps for pr too.

Note: Use input of **bcfun** function to define ul and ur.