2.4.5 $\frac{\partial^2 v}{\partial x^2} = \frac{1}{\kappa}\frac{\partial v}{\partial t} \quad 0 < x < a$

$\frac{\partial v}{\partial x}(0,t) = S_0, \quad \frac{\partial u}{\partial x}(a,t) = S_1 \quad 0 < t.$

$u(x,0) = f(x) \quad 0 < x < a$

$v = C_1 x + C_2$

$\frac{\partial v}{\partial x}(0) = S_0 \quad \frac{\partial v}{\partial x}(a) = S_1$

S_0 should be equal to S_1 as the heat flow in one end should equal the heat flow in the other end.

b) $w(x,t) = u(x,t) - v(x)$

$\frac{\partial w}{\partial x}(0,t) = \frac{\partial u}{\partial x}(0,t) - \frac{\partial v}{\partial x}(0) = 0$

$\frac{\partial w}{\partial x}(a,t) = \frac{\partial u}{\partial x}(a,t) - V_x(a) = 0$

$\therefore w'(0,t) = w'(a,t) = 0$