

Here I show the cooling effects of a rods on a plate. Here is the system:

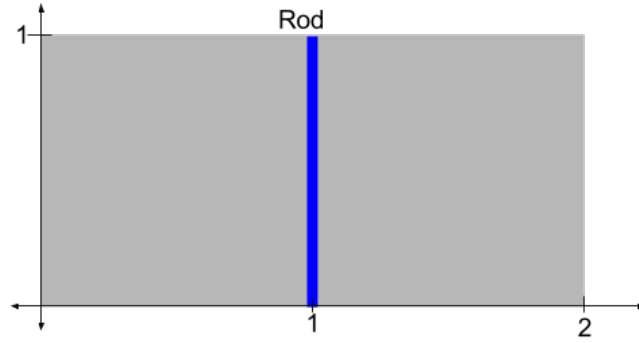


Figure 1: A line and square joined together

### 0.1 Studying the square

The square will have a heat equation  $v(x, y, t)$ .

Here is the square's diffusion equation:

$$\alpha_1 \left( \frac{\partial^2 v}{\partial x^2} + \frac{\partial^2 v}{\partial y^2} \right) = \frac{\partial v}{\partial t}$$

This is the initial condition:

$$v(x, y, 0) = -20x(x - 2)y(y - 1)$$

The boundary conditions are as follows:

$$v(0, y, t) = 0$$

$$v(2, y, t) = 0$$

$$v(x, 0, t) = 0$$

$$v(x, 1, t) = 0$$

## 0.2 Heat Equation Over Rod

The heat equation for the rod  $u(y, t)$  is as follows:

$$\alpha_2 \frac{\partial^2 u}{\partial y^2} = \frac{\partial u}{\partial t}$$

The boundary conditions will be as follows:

$$u(0, t) = 0$$

$$u(1, t) = 0$$

The initial condition for the rod is as follows:

$$u(y, 0) = v(1, y, 0) = -20y(y - 1)$$