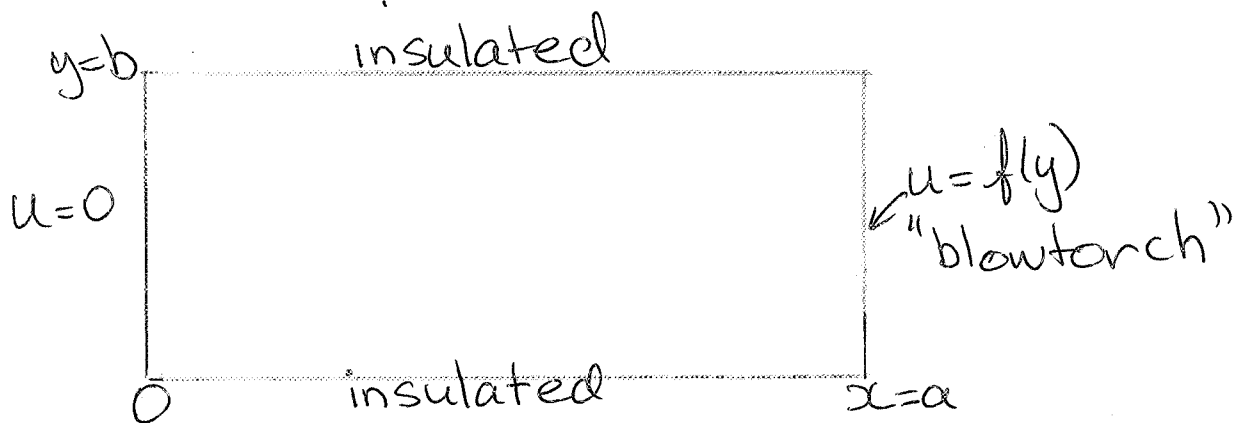


Example 7 Steady State

temperature distribution in a plate
(BBQ)



$$\frac{\partial u}{\partial t} = D \left(\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} \right) \quad \text{diffusion equation in 2D}$$

For steady state $t \rightarrow \infty$ so $\frac{\partial u}{\partial t} = 0$

get $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$ (Laplace's eqn in 2D)

or $\nabla^2 u = 0$

Boundary Conditions

$$u(0, y) = 0$$

$$u(a, y) = f(y) \quad \leftarrow \text{non homog}$$

$$\frac{\partial u}{\partial y}(x, 0) = 0$$

$$\frac{\partial u}{\partial y}(x, b) = 0$$

Solved in lecture and
tried $f(y) = 1 + 3 \cos \frac{\pi y}{b} + 5 \cos \frac{3\pi y}{b}$
without solving a full blown Fourier Series!!