

PROBLEM 1

SOLVE LAPLACE'S EQUATION

$$u_{xx} + u_{yy} = 0 \quad \text{IN} \quad 0 < x < \pi, \quad 0 < y < \pi$$

$$\text{WITH} \quad u(x, 0) = 0 \quad u(x, \pi) = 0$$

$$u(0, y) = 1, \quad u(\pi, y) = 1.$$

PROBLEM 2

SOLVE LAPLACE'S EQUATION

$$u_{xx} + u_{yy} = 0 \quad \text{IN} \quad 0 < x < \pi, \quad 0 < y < \pi$$

$$\text{WITH} \quad u_y(x, 0) = 0 \quad u_y(x, \pi) = 0$$

$$u(0, y) = 0, \quad u(\pi, y) = \frac{1}{2} [1 + \cos(2y)]$$

PROBLEM 3

SOLVE LAPLACE'S EQUATION IN AN INFINITE STRIP-LIKE-DOMAIN

$$u_{xx} + u_{yy} = 0 \quad \text{IN} \quad 0 < x < a, \quad 0 < y < \infty$$

$$u(x, 0) = x \quad u \text{ BOUNDED AS } y \rightarrow +\infty$$

$$u(0, y) = 0, \quad u_x(a, y) = 0$$

PROBLEM 4

SOLVE LAPLACE'S EQUATION

$$u_{xx} + u_{yy} = 0 \quad \text{IN} \quad 0 < x < 2, \quad 0 < y < 1$$

$$u_x(0, y) = 0, \quad u_x(2, y) = 1$$

$$u(x, 0) = 0 \quad u(x, 1) = 0$$

PROBLEM 5CONSIDER $u_{xx} + u_{yy} = 0$ IN $0 < x < \pi, \quad 0 < y < \pi$

WITH BOUNDARY CONDITIONS

$$u_y(x, 0) = u_y(x, \pi) = 0$$

$$u_x(0, y) = 0 \quad \text{AND} \quad u_x(\pi, y) = 1 + a \cos^2(y).$$

FOR WHAT VALUE OF THE PARAMETER "a" DOES A SOLUTION EXIST?