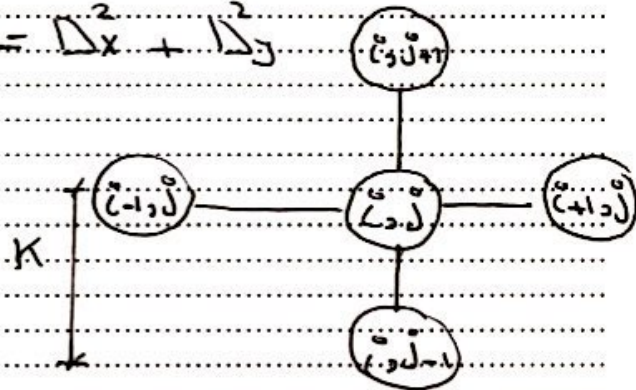


## Engineering Analysis & Numerical Methods

The Numerical Solution of Partial  
 Differential Equations.

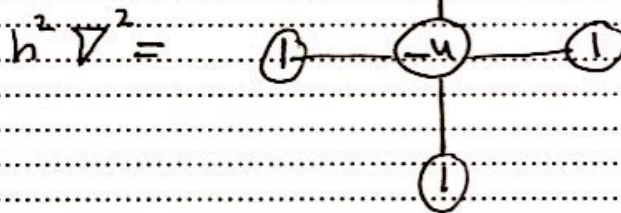
$$\nabla^2 = \frac{\partial^2}{\partial x^2} + \frac{\partial^2}{\partial y^2} = \Delta_x^2 + \Delta_y^2$$



$$\nabla^2 z_i = \frac{z_{i-1,j} - 2z_{i,j} + z_{i+1,j}}{h^2} + \frac{z_{i,j-1} - 2z_{i,j} + z_{i,j+1}}{k^2}$$

If  $h = k$

$$h^2 \nabla^2 z_i = z_{i-1,j} + z_{i+1,j} + z_{i,j-1} + z_{i,j+1} - 4z_{i,j}$$



$$h^4 \nabla^4 = \frac{\partial^4}{\partial x^4} + \frac{\partial^4}{\partial x^2 \partial y^2} + \frac{\partial^4}{\partial y^4}$$