

Problem 138C

A finite difference method is to be used with a mesh having a uniform node spacing, h , in the x and y directions to solve for the quantity, f , which is governed by the following partial differential equation:

$$f \frac{\partial^2 f}{\partial x^2} = -4 \left(\frac{\partial f}{\partial y} \right)^2 \quad (1)$$

Determine the finite difference form of this equation at the node 0 that utilizes values of f at the nodes 0, 1, 2, 3 and 4 as shown below:

