Analytical versus Numerical Solutions

Analytical: Solve a partial differential eq. with initial and boundary conditions.

- Need solution for each particular problem
- Gives dependence on variables (S, T, etc.)
- Only available for relatively simple problems (homogeneous, simple geometry)
- *Examples: Theis, Theim, Analytical Element Method (AEM)*

Numerical: Replace partial derivative with algebraic equation.

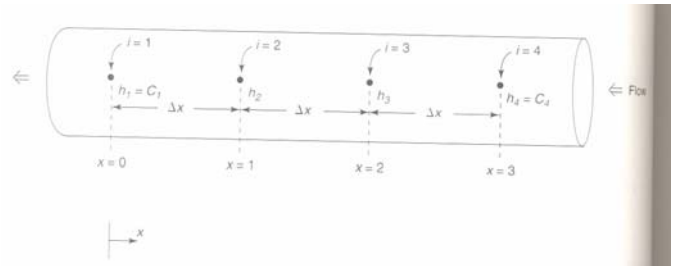
- one solution can handle multiple problems
- heterogeneous as well as complex geometry
- some loss in accuracy if large region
- does not give a continuous solution
- *Examples: Finite Difference Method (FDM), Finite Element Method (FEM)*

Finite Difference Method

Finite Difference Method

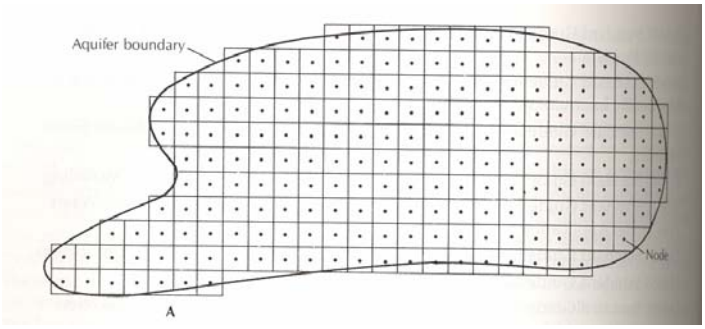
Example: Finite Difference Method

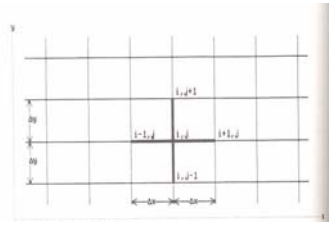
Example: Finite Difference Method



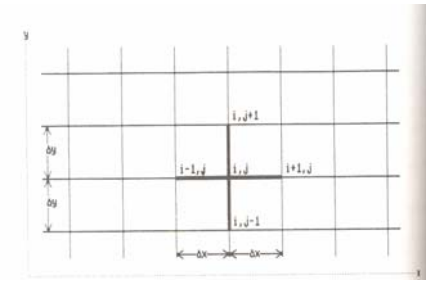
gure 5.12 Discretization for one-dimensional finite-difference problem.

Steady-state 2-D Uniform Flow: Numerical Solution





Spreadsheet Implementation of FDM



Spreadsheet Implementation of FDM

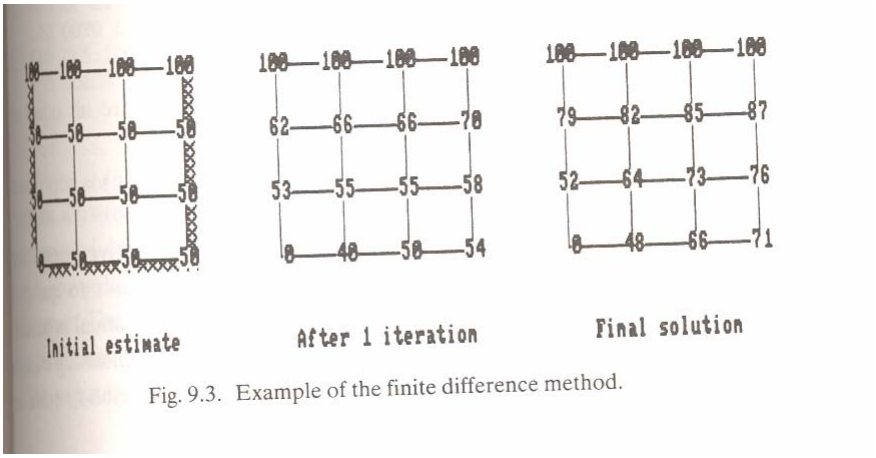


Fig. 9.3. Example of the finite difference method.