Chapter 2

POLYNOMIAL INTERPOLATION / FINITE DIFFERENCES

The polynomial interpolation formulas by Lagrange and Newton - in different variations - form the basis for most traditional techniques for numerical differentiation and quadrature (integration). The first section describes very briefly Lagrange's interpolation formula, and we see in Section 2 how both this one and a couple of other approaches can be used to obtain simple finite difference (FD) formulas. Section 3 presents a recent, very convenient algorithm (only two statements in a symbolic language such as Mathematica) can give a wide range of difference formulas for equi-spaced grids. The numerical algorithm in Section 4 allows also non-uniform grids (but is slightly more limited in the type of formulas that can be produced). In the concluding Section 5, we see how 1-D formulas are combined to produce formulas for 2-D.