

Time discretisation of parabolic problems with the variable 3-step BDF

M. Calvo* and R.D. Grigorieff†

Abstract

In this paper the stability of the 3-step backward differentiation formula (BDF) on variable grids for the numerical integration of time-dependent parabolic problems is analysed. A stability inequality with a stability constant depending in a controllable way on the mesh is obtained. In particular if the ratios r_j of adjacent mesh-sizes of the underlying grid satisfy the bound $r_j \leq \bar{r} < 1.199$ then any mixture of the j -step BDF for $j \in \{1, 2, 3\}$ is stable provided the number of changes between increasing and decreasing mesh-sizes is uniformly bounded. From the stability inequality error estimates can be obtained.

*Universidad de Zaragoza, Facultad de Ciencias, Dpto. de Matemática Aplicada, Edificio Matemáticas, 50009 Zaragoza, Spain. email: calvo@posta.unizar.es

†Technische Universität Berlin, Straße des 17. Juni 135, 10623 Berlin, Germany. email: grigo@math.tu-berlin.de