

MM546/834 PDEs: theory, modeling and computing

Self–study and exercise problems, no 6

1. Formulate the weak form of Trapezoidal rule time stepping for the diffusion equation

$$u_t = \nabla \cdot (d \nabla u) \ .$$

2. Implement an efficient, preassembled Trapezoidal rule for the diffusion equation.
3. Compare the performance of implicit Euler vs. the Trapezoidal rule for different time steps Δt .
4. Both methods are A–stable. Nevertheless the Trapezoidal rule may develop spurious oscillations. How is that compatible with the concept of A–stability?