

Lectures 9/4

We introduced systems of ordinary differential equations (ODE's) (NR p. 899) and then introduce 5 simple solution methods, namely

- Euler's method (Eq. 17.1.1)
- The second order Runge Kutta method (Eq. 17.1.2)
- The implicit Trapezoidal method: $y_{n+1} = y_n + (h/2)[f(x_n, y_n) + f(x_{n+1}, y_{n+1})] + O(h^3)$
- The Leap-frog method: $y_{n+1} = y_{n-1} + 2hf(x_n, y_n) + O(h^3)$
- Fourth order Runge-Kutta (rk4) (Eq. 17.1.3)

We then discussed

- Local convergence order (concerning the accuracy after one step)
- Global convergence order (concerning the accuracy at a fixed x)

With Jens, you tried these methods out on a simple example with two coupled differential equations outlined in the last slide from.

Lectures 23/4

We continue with systems of ordinary differential equations and discuss the concepts of stability for the ODE's themselves and for numerical solution methods. Some quite substantial pitfalls will be outlined. As part of this, it will become clear what the problem is with Leap-frog.