

Lectures 9/4

We will start on 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 discuss

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

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