Lectures 25/4

We will introduce 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 will then discuss

- Local convergence order (concerning the accuracy after one step)
- Global convergence order (concerning the accuracy at a fixed x)
- Stability and stability regions.

With Ole, you will then try these methods out on a simple example with two coupled differential equations.

Lectures 1/5

We will

- Do a brief review of stability, local and global convergence
- Discuss how to use global convergence to estimate the accuracy at a fixed x. This involves also some subtleties with the ODE's.
- Boundary value problems (Chapter 18, details to follow)

With Ole, you will go through the exercise from 25/4 and work on new exercises.