

## III.6 Stiff equations

Basically: stiff problems are problems for which "explicit methods don't work"

The step size has to be chosen much smaller for stability rather than from accuracy considerations

Ex.: (16) Stiff linear system

→ Slides (Stiff linear IVP)

A linear inhomogeneous system of ODEs

$$\vec{y}'(t) = A\vec{y}(t) + \vec{b}(t)$$

↙  
n×n Matrix

is called stiff if the eigenvalues of  $A$ ,  $\lambda_i$  ( $i=1,2,\dots,n$ ), have very different negative real parts:

$$S = \frac{\max_j |\operatorname{Re}(\lambda_j)|}{\min_j |\operatorname{Re}(\lambda_j)|}, \quad \operatorname{Re}(\lambda_j) < 0$$

That is: the stiffness ratio  $S$  is "large".