

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

$$\dot{\vec{y}}(t) = A\vec{y}(t) + \vec{b}(t)$$

$\underbrace{\hspace{10em}}_{n \times n \text{ Matrix}}$

is called stiff if the eigenvalues of A , λ_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".