

Übungen zu **Numerik (für Geowissenschaftler)**

Blatt 3

Ü1 (*Special matrices*) Define the matrix A_n with the matlab command `full(gallery('poisson',n))`.

Calculate for $n = 3, 7, 15, 31, \dots$

- the lu-decomposition and the inverse of A_n
- the norm of the matrix $I_n - D_n^{-1}A_n$, where D_n is the diagonal of A_n .

The command `spy(B)` shows the *nonzeroe* elements of a matrix B .

Ü2 (*Jacobi-, Gauß-Seidel*) Given $Sx = b$, with $S = \begin{bmatrix} 2 & -1 & 0 \\ -1 & 2 & -1 \\ 0 & -1 & 2 \end{bmatrix}$, and

$b = [1, 0, 1]^T$.

- Starting from $x^{(0)} = (0, 0, 0)^T$ do three (or more) steps of Jacobi-iteration.
- Compare with the results of the Gauss-Seidel-method.

Ü3 (*Nonlinear equations*) Solve the equation $x = \cos(x)$

- via the iteration $x^{(k+1)} = \cos(x^{(k)})$, and
- Newton's method.