

→ / · LU factorization · /

→ `A:matrix([1,2,0,1],[2,3,0,1],[0,2,2,1],[3,2,1,1]);`

(A)
$$\begin{pmatrix} 1 & 2 & 0 & 1 \\ 2 & 3 & 0 & 1 \\ 0 & 2 & 2 & 1 \\ 3 & 2 & 1 & 1 \end{pmatrix}$$

→ `Alu:lu_factor(A);`

(Alu)
$$\begin{pmatrix} 1 & 2 & 0 & 1 \\ 2 & -1 & 0 & -1 \\ 0 & -2 & 2 & -1 \\ 3 & 4 & \frac{1}{2} & \frac{5}{2} \end{pmatrix}, [1, 2, 3, 4], \text{generalring}$$

→ `[AP,AL,AU]:get_lu_factors(Alu);`

(%o50)
$$\begin{pmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{pmatrix}, \begin{pmatrix} 1 & 0 & 0 & 0 \\ 2 & 1 & 0 & 0 \\ 0 & -2 & 1 & 0 \\ 3 & 4 & \frac{1}{2} & 1 \end{pmatrix}, \begin{pmatrix} 1 & 2 & 0 & 1 \\ 0 & -1 & 0 & -1 \\ 0 & 0 & 2 & -1 \\ 0 & 0 & 0 & \frac{5}{2} \end{pmatrix}$$

→ / · package "lapack" and precision · /

→ `load(lapack)$
fpprintprec : 6$`

→ `B:matrix([1,2,3],[5,6,4],[9,7,8],[10,11,12]);`

(B)
$$\begin{pmatrix} 1 & 2 & 3 \\ 5 & 6 & 4 \\ 9 & 7 & 8 \\ 10 & 11 & 12 \end{pmatrix}$$

→ / · QR factorization · /

→ `[BQ, BR]:dgeqrf(B);`

$$(\%o52) \begin{bmatrix} -0.0695048 & -0.382144 & 0.501003 & -0.773389 \\ -0.347524 & -0.396771 & -0.798553 & -0.29002 \\ -0.625543 & 0.724062 & 0.0178021 & -0.29002 \\ -0.695048 & -0.415056 & 0.333154 & 0.483368 \end{bmatrix}, \begin{bmatrix} -14.3874 & -14.2484 & -14.9435 \\ 0.0 & -2.64209 & -1.92169 \\ 0.0 & 0.0 & 2.44906 \\ 0.0 & 0.0 & 0.0 \end{bmatrix}$$

→ / · SVD: singular value decomposition · /

→ `dgesvd(B);`

(%o53) `[[25.3468, 2.14879, 1.70929], false, false]`

→ `[BΣ, BU, BVT]:dgesvd(B, true, true);`

$$(\%o55) \begin{bmatrix} -0.138011 & 0.616466 & 0.0528255 & -0.773389 \\ -0.340369 & -0.370276 & -0.814206 & -0.29002 \\ -0.546259 & -0.535425 & 0.575158 & -0.29002 \\ -0.752796 & 0.442925 & -0.0589075 & 0.483368 \end{bmatrix}, \begin{bmatrix} -0.563548 & -0.5690 \\ -0.756003 & 0.06304 \\ 0.332974 & -0.8190 \end{bmatrix}$$