

```
> with(linalg);
```

```
Warning, the protected names norm and trace have been redefined and
unprotected
```

[*BlockDiagonal, GramSchmidt, JordanBlock, LUdecomp, QRdecomp, Wronskian, addcol, addrow, adj, adjoint, angle, augment, backsub, band, basis, bezout, blockmatrix, charmat, charpoly, cholesky, col, coldim, colspace, colspan, companion, concat, cond, copyinto, crossprod, curl, definite, delcols, delrows, det, diag, diverge, dotprod, eigenvals, eigenvalues, eigenvectors, eigenvects, entermatrix, equal, exponential, extend, ffgausseim, fibonacci, forwardsub, frobenius, gausseim, gaussjord, geneqns, genmatrix, grad, hadamard, hermite, hessian, hilbert, htranspose, ihermite, indexfunc, innerprod, intbasis, inverse, ismith, issimilar, iszero, jacobian, jordan, kernel, laplacian, leastsqrs, linsolve, matadd, matrix, minor, minpoly, mulcol, mulrow, multiply, norm, normalize, nullspace, orthog, permanent, pivot, potential, randmatrix, randvector, rank, ratform, row, rowdim, rowspace, rowspan, rref, scalarmul, singularvals, smith, stackmatrix, submatrix, subvector, subbasis, swapcol, swaprow, sylvester, toeplitz, trace, transpose, vandermonde, vecpotent, vectdim, vector, wronskian*]

Determinantenberechnung mit den Moduln

$m_1 = 29, m_2 = 31, m_3 = 37, m_4 = 41$

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> M := 29*31*37*41;
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M := 1363783
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> A := randmatrix(3,3);
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```
A :=  $\begin{bmatrix} 77 & 66 & 54 \\ -5 & 99 & -61 \\ -50 & -12 & -18 \end{bmatrix}$ 
```

```
> d := det(A);
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```
d := 272322
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```
> A29 := map(modp,A,29);
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A29 :=  $\begin{bmatrix} 19 & 8 & 25 \\ 24 & 12 & 26 \\ 8 & 17 & 11 \end{bmatrix}$ 
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> d29 := Det(A29) mod 29;
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d29 := 12
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```
> A31 := map(modp,A,31);
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A31 :=  $\begin{bmatrix} 15 & 4 & 23 \\ 26 & 6 & 1 \\ 12 & 19 & 13 \end{bmatrix}$ 
```

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> d31 := Det(A31) mod 31;
                                     d31 := 18
> A37 := map(modp,A,37);
                                     A37 :=  $\begin{bmatrix} 3 & 29 & 17 \\ 32 & 25 & 13 \\ 24 & 25 & 19 \end{bmatrix}$ 
> d37 := Det(A37) mod 37;
                                     d37 := 2
> A41 := map(modp,A,41);
                                     A41 :=  $\begin{bmatrix} 36 & 25 & 13 \\ 36 & 17 & 21 \\ 32 & 29 & 23 \end{bmatrix}$ 
> d41 := Det(A41) mod 41;
                                     d41 := 0
> dd := chrem([d29,d31,d37,d41],[29,31,37,41]);
                                     dd := 272322

```

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> A := randmatrix(3,3);
      A :=  $\begin{bmatrix} 31 & -26 & -62 \\ 1 & -47 & -91 \\ -47 & -61 & 41 \end{bmatrix}$ 
> d := det(A);
      d := -201214
> A29 := map(modp,A,29);
      A29 :=  $\begin{bmatrix} 2 & 3 & 25 \\ 1 & 11 & 25 \\ 11 & 26 & 12 \end{bmatrix}$ 
> d29 := Det(A29) mod 29;
      d29 := 17
> A31 := map(modp,A,31);
      A31 :=  $\begin{bmatrix} 0 & 5 & 0 \\ 1 & 15 & 2 \\ 15 & 1 & 10 \end{bmatrix}$ 
> d31 := Det(A31) mod 31;
      d31 := 7
> A37 := map(modp,A,37);
      A37 :=  $\begin{bmatrix} 31 & 11 & 12 \\ 1 & 27 & 20 \\ 27 & 13 & 4 \end{bmatrix}$ 
> d37 := Det(A37) mod 37;
      d37 := 29
> A41 := map(modp,A,41);
      A41 :=  $\begin{bmatrix} 31 & 15 & 20 \\ 1 & 35 & 32 \\ 35 & 21 & 0 \end{bmatrix}$ 
> d41 := Det(A41) mod 41;
      d41 := 14
> dd := chrem([d29,d31,d37,d41],[29,31,37,41]);
      dd := 1162569
> d-dd mod M;

```

0

```

> A := randmatrix(3,3);
      A :=  $\begin{bmatrix} -58 & -90 & 53 \\ -1 & 94 & 83 \\ -86 & 23 & -84 \end{bmatrix}$ 
> d := det(A);
      d := 1645903
> A29 := map(modp,A,29);
      A29 :=  $\begin{bmatrix} 0 & 26 & 24 \\ 28 & 7 & 25 \\ 1 & 23 & 3 \end{bmatrix}$ 
> d29 := Det(A29) mod 29;
      d29 := 8
> A31 := map(modp,A,31);
      A31 :=  $\begin{bmatrix} 4 & 3 & 22 \\ 30 & 1 & 21 \\ 7 & 23 & 9 \end{bmatrix}$ 
> d31 := Det(A31) mod 31;
      d31 := 20
> A37 := map(modp,A,37);
      A37 :=  $\begin{bmatrix} 16 & 21 & 16 \\ 36 & 20 & 9 \\ 25 & 23 & 27 \end{bmatrix}$ 
> d37 := Det(A37) mod 37;
      d37 := 32
> A41 := map(modp,A,41);
      A41 :=  $\begin{bmatrix} 24 & 33 & 12 \\ 40 & 12 & 1 \\ 37 & 23 & 39 \end{bmatrix}$ 
> d41 := Det(A41) mod 41;
      d41 := 40
> dd := chrem([d29,d31,d37,d41],[29,31,37,41]);
      dd := 282120
> d-dd mod M;

```

0