601)

```
> restart
> with(linalg) :
> A := matrix(2, 3, [1, 2, 3, -1, 0, 2])
```

$$A := \begin{bmatrix} 1 & 2 & 3 \\ -1 & 0 & 2 \end{bmatrix} \quad (1)$$

```
> B := matrix(2, 3, [-1, 5, -2, 2, 2, -1])
```

$$B := \begin{bmatrix} -1 & 5 & -2 \\ 2 & 2 & -1 \end{bmatrix} \quad (2)$$

```
> W := A + B
```

$$W := A + B \quad (3)$$

```
> evalm(W)
```

$$\begin{bmatrix} 0 & 7 & 1 \\ 1 & 2 & 1 \end{bmatrix} \quad (4)$$

```
> U := transpose(A&*transpose(B))
```

$$U := \begin{bmatrix} 3 & -3 \\ 3 & -4 \end{bmatrix} \quad (5)$$

```
> evalm(U)
```

$$\begin{bmatrix} 3 & -3 \\ 3 & -4 \end{bmatrix} \quad (6)$$

```
> V := B&*transpose(A)
```

$$V := B \,\&* \begin{bmatrix} 1 & -1 \\ 2 & 0 \\ 3 & 2 \end{bmatrix} \quad (7)$$

```
> evalm(V)
```

$$\begin{bmatrix} 3 & -3 \\ 3 & -4 \end{bmatrix} \quad (8)$$

602)

```
> restart
> with(linalg) :
> A := matrix(3, 3, [1, -2, 5, -2, 3, 0, 5, 0, 2])
```

$$A := \begin{bmatrix} 1 & -2 & 5 \\ -2 & 3 & 0 \\ 5 & 0 & 2 \end{bmatrix} \quad (9)$$

```
> B := matrix(3, 3, [1, 2, 0, 2, 1, 4, 0, 4, 2])
```

(10)

$$B := \begin{bmatrix} 1 & 2 & 0 \\ 2 & 1 & 4 \\ 0 & 4 & 2 \end{bmatrix} \quad (10)$$

> $det(A)$

$$-77 \quad (11)$$

> $U := inverse(A\&*B)$

$$U := \begin{bmatrix} -\frac{10}{77} & -\frac{2}{77} & \frac{1}{7} \\ \frac{2}{77} & -\frac{1}{77} & \frac{2}{77} \\ \frac{1}{22} & \frac{1}{11} & -\frac{1}{22} \end{bmatrix} \quad (12)$$

> $evalm(U)$

$$\begin{bmatrix} -\frac{10}{77} & -\frac{2}{77} & \frac{1}{7} \\ \frac{2}{77} & -\frac{1}{77} & \frac{2}{77} \\ \frac{1}{22} & \frac{1}{11} & -\frac{1}{22} \end{bmatrix} \quad (13)$$

> $V := inverse(B)\&*inverse(A)$

$$V := \begin{bmatrix} \frac{7}{11} & \frac{2}{11} & -\frac{4}{11} \\ \frac{2}{11} & -\frac{1}{11} & \frac{2}{11} \\ -\frac{4}{11} & \frac{2}{11} & \frac{3}{22} \end{bmatrix} \&* \begin{bmatrix} -\frac{6}{77} & -\frac{4}{77} & \frac{15}{77} \\ -\frac{4}{77} & \frac{23}{77} & \frac{10}{77} \\ \frac{15}{77} & \frac{10}{77} & \frac{1}{77} \end{bmatrix} \quad (14)$$

> $evalm(V)$

$$\begin{bmatrix} -\frac{10}{77} & -\frac{2}{77} & \frac{1}{7} \\ \frac{2}{77} & -\frac{1}{77} & \frac{2}{77} \\ \frac{1}{22} & \frac{1}{11} & -\frac{1}{22} \end{bmatrix} \quad (15)$$

603)

> $restart$

> $with(linalg)$:

> $A := matrix(3, 3, [5, -3, -2, 3, -4, -3, 6, 5, -5])$

(16)

$$A := \begin{bmatrix} 5 & -3 & -2 \\ 3 & -4 & -3 \\ 6 & 5 & -5 \end{bmatrix} \tag{16}$$

> $b := vector(3, [7, 1, -8])$

$$b := \begin{bmatrix} 7 & 1 & -8 \end{bmatrix} \tag{17}$$

> $linsolve(A, b)$

$$\begin{bmatrix} 2 & -1 & 3 \end{bmatrix} \tag{18}$$

604)

> $restart$

> $with(linalg) :$

> $amat := matrix(3, 3, [1, -1, 1, -2, 1, a, 1, a, -1])$

$$amat := \begin{bmatrix} 1 & -1 & 1 \\ -2 & 1 & a \\ 1 & a & -1 \end{bmatrix} \tag{19}$$

> $avec := vector(3, [2, -3, 1])$

$$avec := \begin{bmatrix} 2 & -3 & 1 \end{bmatrix} \tag{20}$$

> $asol := linsolve(amat, avec)$

$$asol := \begin{bmatrix} \frac{2\,(2+a)}{3+a} & -\frac{1}{3+a} & \frac{1}{3+a} \end{bmatrix} \tag{21}$$

> $ax := unapply(asol[1], a)$

$$ax := a \rightarrow \frac{2\,(2+a)}{3+a} \tag{22}$$

> $ay := unapply(asol[2], a)$

$$ay := a \rightarrow -\frac{1}{3+a} \tag{23}$$

> $az := unapply(asol[3], a)$

$$az := a \rightarrow \frac{1}{3+a} \tag{24}$$

>

> $bmat := matrix(3, 3, [7, -3, a, 70, 2, 5, 19, 1, 16])$

$$bmat := \begin{bmatrix} 7 & -3 & a \\ 70 & 2 & 5 \\ 19 & 1 & 16 \end{bmatrix} \tag{25}$$

> $bvec := vector(3, [29, a, 41])$

$$bvec := \begin{bmatrix} 29 & a & 41 \end{bmatrix} \tag{26}$$

> $bsol := linsolve(bmat, bvec)$

$$bsol := \begin{bmatrix} \frac{1}{32} & \frac{a^2 + 168 - 34\,a}{102 + a} & -\frac{1}{32} & \frac{19\,a^2 + 31160 - 2982\,a}{102 + a} & -\frac{2\,(-158 + a)}{102 + a} \end{bmatrix} \tag{27}$$

```
> bx := unapply(bsol[1], a)
```

$$bx := a \to \frac{1}{32}\ \frac{a^2 + 168 - 34\,a}{102 + a} \tag{28}$$

```
> by604 := unapply(bsol[2], a)
```

$$by604 := a \to -\frac{1}{32}\ \frac{19\,a^2 + 31160 - 2982\,a}{102 + a} \tag{29}$$

```
> bz := unapply(bsol[3], a)
```

$$bz := a \to -\frac{2\,(-158 + a)}{102 + a} \tag{30}$$

```
>
```

Erneuter Versuch mit solve

```
> restart
> gl604a := [x - y + z = 2, -2·x + y + a·z = -3, x + a·y - z = 1]
```

$$gl604a := [x - y + z = 2,\ -2\,x + y + a\,z = -3,\ x + a\,y - z = 1] \tag{31}$$

```
> solve(gl604a, [x, y, z])
```

$$\left[\left[x = \frac{2\,(2 + a)}{3 + a},\ y = -\frac{1}{3 + a},\ z = \frac{1}{3 + a}\right]\right] \tag{32}$$

```
> assign(%)
>
>
>
```

605)

```
> restart
> with(linalg) :
> A := matrix(3, 3, [2, -3, 1, 3, 1, 3, -5, 2, -4])
```

$$A := \begin{bmatrix} 2 & -3 & 1 \\ 3 & 1 & 3 \\ -5 & 2 & -4 \end{bmatrix} \tag{33}$$

```
> eigenvalues(A)
```

$$0,\ 1,\ -2 \tag{34}$$

```
> eigenvectors(A)
```

$$\left[1, 1, \left\{\begin{bmatrix} -1 & 0 & 1 \end{bmatrix}\right\}\right], \left[-2, 1, \left\{\begin{bmatrix} \frac{4}{3} & 1 & -\frac{7}{3} \end{bmatrix}\right\}\right], \left[0, 1, \left\{\begin{bmatrix} 1 & \frac{3}{10} & -\frac{11}{10} \end{bmatrix}\right\}\right] \tag{35}$$

```
> ID := matrix(3, 3, [1, 0, 0, 0, 1, 0, 0, 0, 1])
```

$$ID := \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix} \tag{36}$$

```
> A - 2·ID
```

$$A - 2\,ID \tag{37}$$

```
> evalm(%)
```

$$\begin{bmatrix} 0 & -3 & 1 \\ 3 & -1 & 3 \\ -5 & 2 & -6 \end{bmatrix} \tag{38}$$

>