Lösungen

```
Remove["Global`*"]
```

Aufgabe 1a

```
g1= (1 x + 1 y + 1 z == 1 );
g2= (0 x + 1 y + 1 z == 1 );
g3= (0 x + 0 y + 1 z == 1 );
Solve[{g1,g2,g3},{x,y,z}]
```

$$\{\{x \to 0,\ y \to 0,\ z \to 1\}\}$$

Aufgabe 1b

```
g1= (1 x + 1 y + 1 z == 1 );
g2= (1 x + 2 y + 3 z == 1 );
g3= (1 x + 4 y + 9 z == 1 );
Solve[{g1,g2,g3},{x,y,z}]
```

$$\{\{x \to 1,\ y \to 0,\ z \to 0\}\}$$

Aufgabe 2

```
g1 = (λ x - 5 y + 6 z + 7 w == 8 );
g2 = (4 x - 8 y + 9 z + 1 w == 1 );
g3 = (1 x + 1 y - 1 z + 1 w == 0 );
```

---

a

```
Solve[{g1, g2, g3}, {x, y, z}] /. λ → 3  // Flatten
```

$$\left\{x \to \frac{1}{4}\,(-7+3\,w),\ y \to \frac{1}{4}\,(95-79\,w),\ z \to \frac{1}{4}\,(88-72\,w)\right\}$$

w ist Parameter!

---

b

```
Solve[{g1, g2, g3}, {x, y, z}] // Flatten
```

$$\left\{x \to -\frac{-7+3\,w}{-7+\lambda},\ y \to -\frac{98-109\,w-\lambda+10\,w\,\lambda}{-7+\lambda},\ z \to -\frac{91-99\,w-\lambda+9\,w\,\lambda}{-7+\lambda}\right\}$$

```
Solve[{g1, g2, g3}, {x, y, z}] /. λ → 7 // Flatten
```

```
Power::infy : Infinite expression 1/0 encountered. Mehr…

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General::stop : Further output of Power::infy will be suppressed during this calculation. Mehr…

{x → ComplexInfinity, y → ComplexInfinity, z → ComplexInfinity}
```

= 7 !

---

c

```
Clear[λ]; λ
```

```
λ
```

Ord=4, Dim = 2 -> Rang = 2 -> so wählen, dass g1= 1 g2 + 2 g3 :

```
Solve[{λ, -5, 6, 7, 8} == μ1 {4, -8, 9, 1, 1} + μ2 {1, 1, -1, 1, 0}, {λ, μ1, μ2}]
```

```
{}
```

Keine Lösung

Aufgabe 3

```
g11 = {1, 1, 1, 1, 1};
g21 = {1, 2, 3, 4, 2};
g31 = {1, 4, 9, 16, 3};
g41 = {1, 8, 27, 64, 4};
{g11, g21, g31, g41} // MatrixForm
```

$$\begin{pmatrix} 1 & 1 & 1 & 1 & 1 \\ 1 & 2 & 3 & 4 & 2 \\ 1 & 4 & 9 & 16 & 3 \\ 1 & 8 & 27 & 64 & 4 \end{pmatrix}$$

```
{g12 = g11, g22 = g21 - g11, g32 = g31 - g11, g42 = g41 - g11} // MatrixForm
```

$$\begin{pmatrix} 1 & 1 & 1 & 1 & 1 \\ 0 & 1 & 2 & 3 & 1 \\ 0 & 3 & 8 & 15 & 2 \\ 0 & 7 & 26 & 63 & 3 \end{pmatrix}$$

```
{g13 = g12 - g22, g23 = g22, g33 = g32 - 3 g22, g43 = g42 - 7 g22} // MatrixForm
```

$$\begin{pmatrix} 1 & 0 & -1 & -2 & 0 \\ 0 & 1 & 2 & 3 & 1 \\ 0 & 0 & 2 & 6 & -1 \\ 0 & 0 & 12 & 42 & -4 \end{pmatrix}$$

```
{g14 = g13 + 1 / 2 g33, g24 = g23 - g33, g34 = 1 / 2 g33, g44 = g43 - 12 g34} // MatrixForm
```

$$\begin{pmatrix} 1 & 0 & 0 & 1 & -\frac{1}{2} \\ 0 & 1 & 0 & -3 & 2 \\ 0 & 0 & 1 & 3 & -\frac{1}{2} \\ 0 & 0 & 0 & 6 & 2 \end{pmatrix}$$

```
g45 = 1 / 6 g44;
{g15 = g14 - g45, g25 = g24 + 3 g45, g35 = g34 - 3 g45, g45} // MatrixForm
```

$$\begin{pmatrix} 1 & 0 & 0 & 0 & -\frac{5}{6} \\ 0 & 1 & 0 & 0 & 3 \\ 0 & 0 & 1 & 0 & -\frac{3}{2} \\ 0 & 0 & 0 & 1 & \frac{1}{3} \end{pmatrix}$$

Aufgabe 4

```
Clear[x, y, z, w, g1, g2, g3, g4]

g1 = (1 x + 1 y + 1 z + 1 w == 1);
g2 = (1 x + 2 y + 3 z + 4 w == 2);
g3 = (2 x + 3 y + 4 z + 5 w == 3);
g4 = (0 x + 1 y + 2 z + 3 w == 1);

Solve[{g1, g2, g3, g4}, {x, y, z, w}] // Flatten
```

```
Solve::svars : Equations may not give solutions for all "solve" variables. Mehr…

{x → 2 w + z, y → 1 - 3 w - 2 z}
```

Ord=4, Dim=2, Rang r =Rang r0 =2

Aufgabe 5

```
g1 = (1 x + 1 y + 1 z + 1 w == 1);
g2 = (1 x + 2 y + 3 z + 4 w == 2);
g3 = (2 x + 3 y + 4 z + 5 w == 1);
g4 = (0 x + 1 y + 2 z + 3 w == 3);
Solve[{g1, g2, g3, g4}, {x, y, z, w}] // Flatten
```

```
{}
```

Ord=4, Rang r>2, Rang r0 =2, keine Lösung