Lösungen

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

1

```
B = {{1, 2}, {3, 4}};  B // MatrixForm
```

$$\begin{pmatrix} 1 & 2 \\ 3 & 4 \end{pmatrix}$$

```
Inverse[B] // MatrixForm
```

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

```
mD = {{1, 0}, {0, 2}};  mD // MatrixForm
```

$$\begin{pmatrix} 1 & 0 \\ 0 & 2 \end{pmatrix}$$

a

```
A = B.mD.Inverse[B];
A // MatrixForm
```

$$\begin{pmatrix} 4 & -1 \\ 6 & -1 \end{pmatrix}$$

b

```
Eigenvalues[A]
```

```
{2, 1}
```

```
λ1 = Eigenvalues[A][[1]]
```

```
2
```

```
λ2 = Eigenvalues[A][[2]]
```

```
1
```

c

```
Eigenvectors[A]
```

```
{{1, 2}, {1, 3}}
```

```
x1 = Eigenvectors[A][[1]]
```

```
{1, 2}
```

```
x2 = Eigenvectors[A][[2]]
```

```
{1, 3}
```

```
Eigensystem[A]
```

```
{{2, 1}, {{1, 2}, {1, 3}}}
```

d

```
v = {8, -6}
```

```
{8, -6}
```

```
solv = Solve[v == α x1 + β x2, {α, β}] // Flatten
```

```
{α → 30, β → -22}
```

```
α1 = α /. solv
```

```
30
```

```
β1 = β /. solv
```

```
-22
```

e

```
A.v
```

```
{38, 54}
```

f

```
α1 λ1 x1 + β1 λ2 x2
```

```
{38, 54}
```

2

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

```
B = {{1, 2, 3}, {2, 3, 4}, {3, 4, 4}};  B // MatrixForm
```

$$\begin{pmatrix} 1 & 2 & 3 \\ 2 & 3 & 4 \\ 3 & 4 & 4 \end{pmatrix}$$

```
Inverse[B] // MatrixForm
```

$$\begin{pmatrix} -4 & 4 & -1 \\ 4 & -5 & 2 \\ -1 & 2 & -1 \end{pmatrix}$$

```
mD = {{1, 0, 0}, {0, 2, 0}, {0, 0, 3}}; mD // MatrixForm
```

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

```
A = B.mD.Inverse[B];
A // MatrixForm
```

$$\begin{pmatrix} 3 & 2 & -2 \\ 4 & 2 & -2 \\ 8 & -4 & 1 \end{pmatrix}$$

```
Eigensystem[A]
```

```
{{3, 2, 1}, {{3, 4, 4}, {2, 3, 4}, {1, 2, 3}}}
```

```
Eigenvalues[A]
```

```
{3, 2, 1}
```

```
λ1 = Eigenvalues[A][[1]]
```

```
3
```

```
λ2 = Eigenvalues[A][[2]]
```

```
2
```

```
λ3 = Eigenvalues[A][[3]]
```

```
1
```

```
Eigenvectors[A]
```

```
{{3, 4, 4}, {2, 3, 4}, {1, 2, 3}}
```

```
x1 = Eigenvectors[A][[1]]
```

```
{3, 4, 4}
```

```
x2 = Eigenvectors[A][[2]]
```

```
{2, 3, 4}
```

```
x3 = Eigenvectors[A][[3]]
```

```
{1, 2, 3}
```

```
v = {8, -6, 14}
```

```
{8, -6, 14}
```

```
solv = Solve[v == α x1 + β x2 + γ x3, {α, β, γ}] // Flatten
```

```
{α → -34, β → 90, γ → -70}
```

```
α1 = α /. solv
```

```
-34
```

```
β1 = β /. solv
```

```
90
```

```
γ1 = γ /. solv
```

```
-70
```

```
A.v
```

```
{-16, -8, 102}
```

```
α1 λ1 x1 + β1 λ2 x2 + γ1 λ3 x3
```

```
{-16, -8, 102}
```

3

Selbststudium

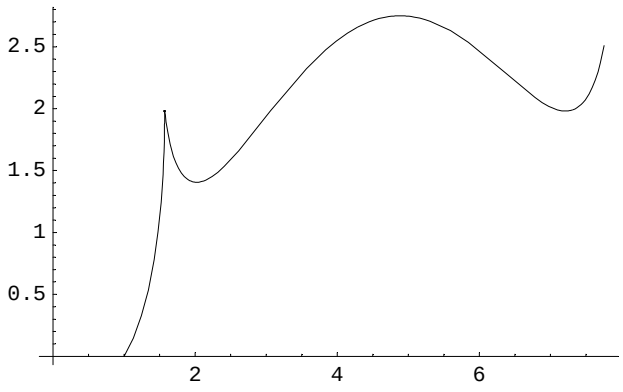
4

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

a Abbidlung einer Kurve

```
v[t_] := {Cos[t] + t, Log[t + 1] + Sin[t]^2}
```

```
ParametricPlot[v[t], {t, 0, 7}];
```



b

```
A = {{2, 1}, {1, 3}};
Eigensystem[A]
```

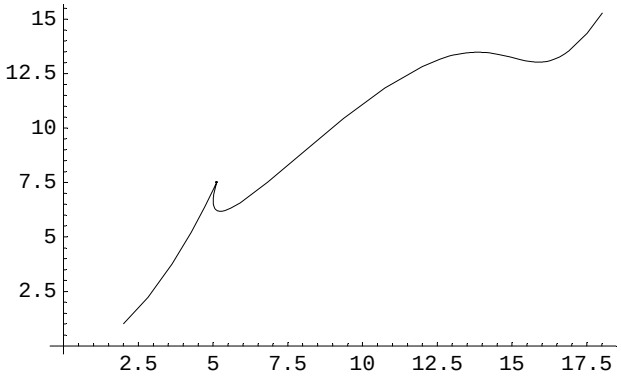
$$\left\{\left\{\frac{1}{2}\left(5+\sqrt{5}\right), \frac{1}{2}\left(5-\sqrt{5}\right)\right\}, \left\{\left\{-3+\frac{1}{2}\left(5+\sqrt{5}\right), 1\right\}, \left\{-3+\frac{1}{2}\left(5-\sqrt{5}\right), 1\right\}\right\}\right\}$$

c

```
A.v[t]
```

$$\{2\,(t+\text{Cos}[t])+\text{Log}[1+t]+\text{Sin}[t]^2,\ t+\text{Cos}[t]+3\,(\text{Log}[1+t]+\text{Sin}[t]^2)\}$$

```
ParametricPlot[A.v[t], {t, 0, 7}];
```



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