

■ Eigenwerte und Eigenvektoren 2D

Setze Eigenvektoren

```
In[1]:= EV1 = {1, 3};  
        EV2 = {2, 1};
```

Setze Eigenwerte

```
In[3]:= λ = -3;  
        μ = 2;
```

Bestimme Matrix mit obigen Eigenwerten und Eigenvektoren

```
In[5]:= A = DiagonalMatrix[{λ, μ}]
```

```
Out[5]=  $\begin{pmatrix} -3 & 0 \\ 0 & 2 \end{pmatrix}$ 
```

```
In[6]:= B = Transpose[{EV1, EV2}]
```

```
Out[6]=  $\begin{pmatrix} 1 & 2 \\ 3 & 1 \end{pmatrix}$ 
```

```
In[7]:= A = B.A.Inverse[B]
```

```
Out[7]=  $\begin{pmatrix} 3 & -2 \\ 3 & -4 \end{pmatrix}$ 
```

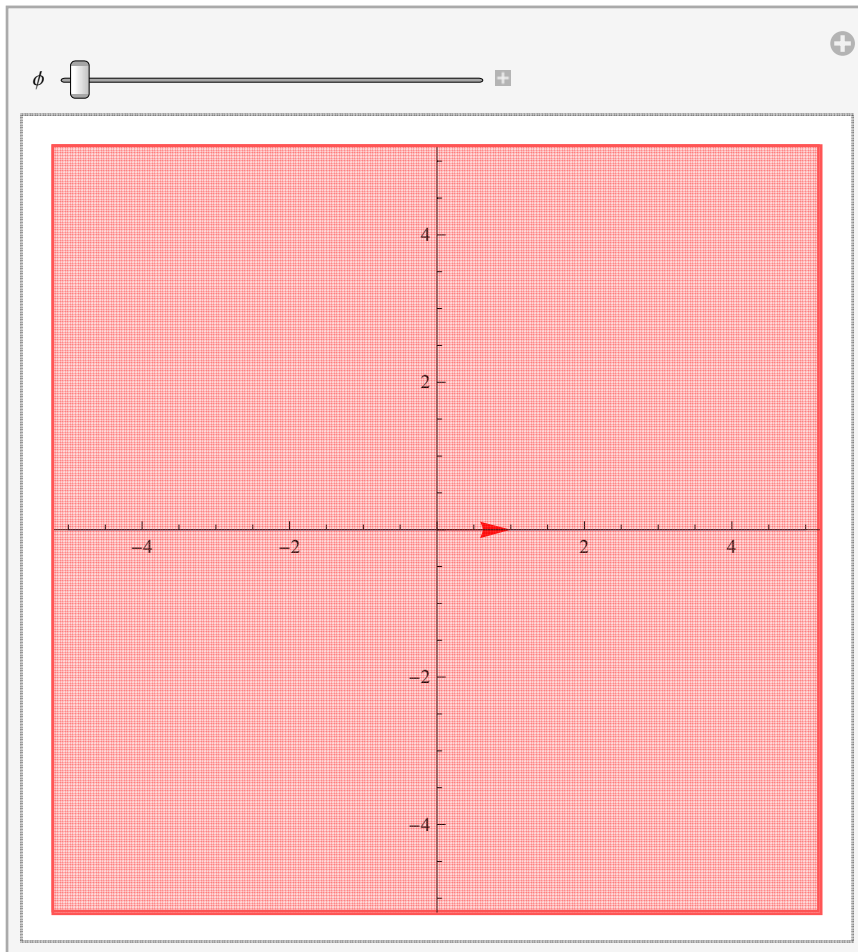
Entdecke Eigenvektoren

```

In[8]:= p1 = Plot[0, {x, -5, 5}, AspectRatio -> 1];
Manipulate[
  Show[
    p1,
    Graphics[{Red, Arrow[{0, 0}, {Cos[phi], Sin[phi]}]}],
    Graphics[{Blue, Arrow[{0, 0}, A.{Cos[phi], Sin[phi]}]}],
    PlotRange -> {-5, 5}
  ],
  {phi, 0, 2 Pi}
]

```

Out[9]=



Dot::dotsh : Tensors $\begin{pmatrix} 17 & 5 & -10 \\ 0 & 2 & 0 \\ 30 & 10 & -18 \end{pmatrix}$ and $\{1, 0\}$ have incompatible shapes. >>

```
In[10]:= Eigenvectors[A]
```

```
Out[10]=  $\begin{pmatrix} 1 & 3 \\ 2 & 1 \end{pmatrix}$ 
```

```
In[11]:= Eigenvalues[A]
```

```
Out[11]= {-3, 2}
```

Untersuche ersten Eigenvektor

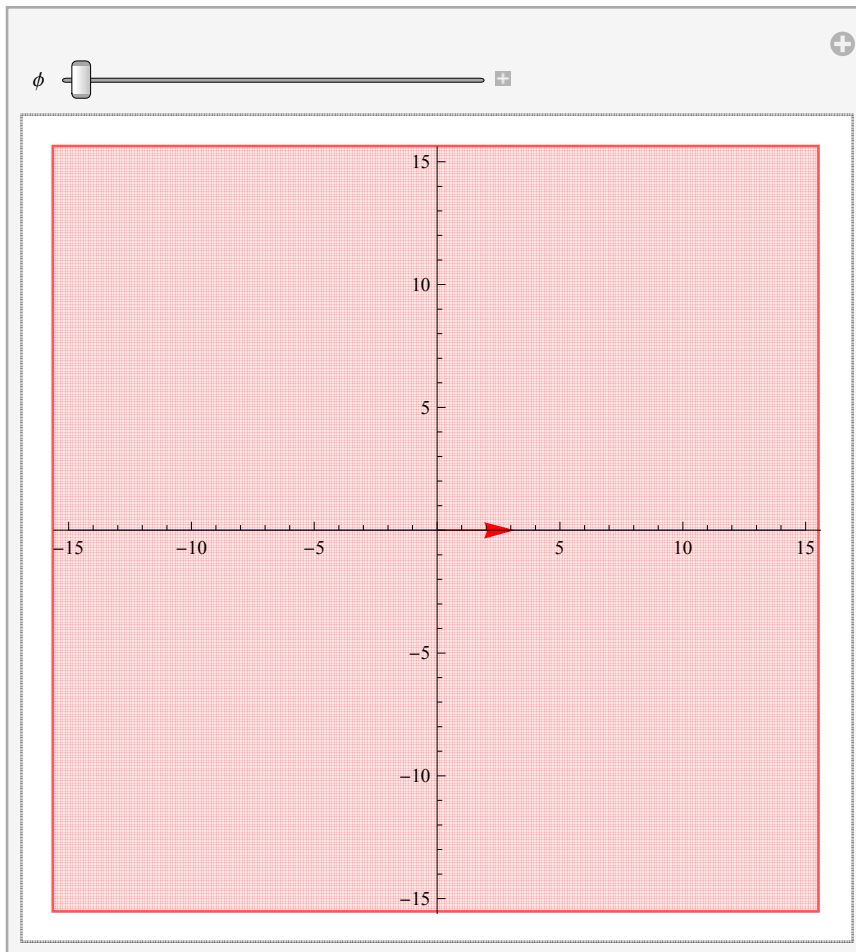
```

In[12]:= p2 = Plot[0, {x, -15, 15}, AspectRatio -> 1];
r1 = Norm[Eigenvectors[A] [[1]]];
Manipulate[
  Show[
    p2,
    Graphics[{Red, Arrow[{0, 0}, {r1 Cos[phi], r1 Sin[phi]}]}],
    Graphics[{Blue, Arrow[{0, 0}, A.{r1 Cos[phi], r1 Sin[phi]}]}],
    Graphics[{Black, Arrow[{0, 0}, Eigenvectors[A] [[1]]]}],
    PlotRange -> {-15, 15}
  ],
  {phi, 0, 2 Pi}
]

```



Out[14]=



Dot::dotsh : Tensors $\begin{pmatrix} 17 & 5 & -10 \\ 0 & 2 & 0 \\ 30 & 10 & -18 \end{pmatrix}$ and $\{\sqrt{10}, 0\}$ have incompatible shapes. >>

Untersuche zweiten Eigenvektor

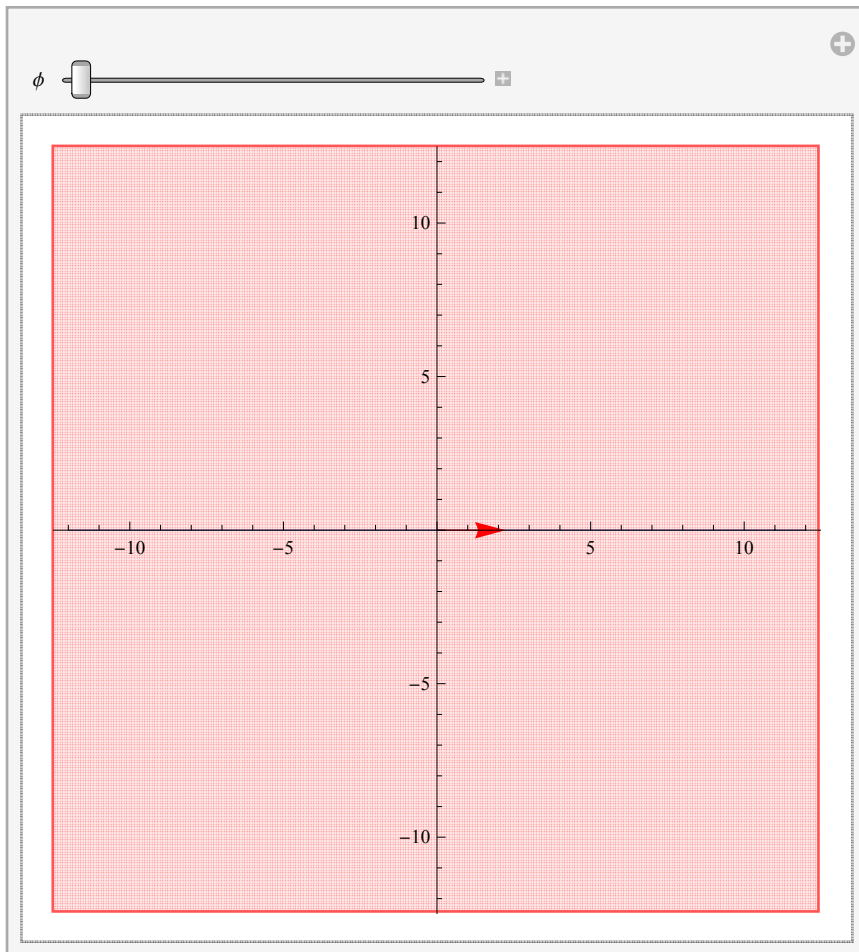
```

In[15]:= p3 = Plot[0, {x, -12, 12}, AspectRatio -> 1];
r2 = Norm[Eigenvectors[A] [[2]]];
Manipulate[
  Show[
    p3,
    Graphics[{Red, Arrow[{0, 0}, {r2 Cos[phi], r2 Sin[phi]}]}],
    Graphics[{Blue, Arrow[{0, 0}, A.{r2 Cos[phi], r2 Sin[phi]}]}],
    Graphics[{Black, Arrow[{0, 0}, Eigenvectors[A] [[2]]]}],
    PlotRange -> {-12, 12}
  ],
  {phi, 0, 2 Pi}
]

```



Out[17]=



Dot::dotsh : Tensors $\begin{pmatrix} 17 & 5 & -10 \\ 0 & 2 & 0 \\ 30 & 10 & -18 \end{pmatrix}$ and $\{\sqrt{5}, 0\}$ have incompatible shapes. >>

■ Eigenwerte und Eigenvektoren 3D

Setze Eigenvektoren

```

In[18]:= EV1 = {1, 0, 2};
EV2 = {0, 2, 1};
EV3 = {-1, 3, 0};

```

Setze Eigenwerte

```
In[21]:= λ = -3;
        μ = 2;
```

Bestimme Matrix mit obigen Eigenwerten und Eigenvektoren

```
In[23]:= A = DiagonalMatrix[{λ, μ, μ}]
```

```
Out[23]=  $\begin{pmatrix} -3 & 0 & 0 \\ 0 & 2 & 0 \\ 0 & 0 & 2 \end{pmatrix}$ 
```

```
In[24]:= B = Transpose[{EV1, EV2, EV3}]
```

```
Out[24]=  $\begin{pmatrix} 1 & 0 & -1 \\ 0 & 2 & 3 \\ 2 & 1 & 0 \end{pmatrix}$ 
```

```
In[25]:= A = B.A.Inverse[B]
```

```
Out[25]=  $\begin{pmatrix} 17 & 5 & -10 \\ 0 & 2 & 0 \\ 30 & 10 & -18 \end{pmatrix}$ 
```

```
In[26]:= Eigenvectors[A]
```

```
Out[26]=  $\begin{pmatrix} 1 & 0 & 2 \\ 2 & 0 & 3 \\ -1 & 3 & 0 \end{pmatrix}$ 
```

```
In[27]:= Eigenvalues[A]
```

```
Out[27]= {-3, 2, 2}
```