Lösungen I / 8

1

Rechnung mit Vektorprodukt:

```
vO = {0,0,0}; vA = {4,3,0}; vB = {6,5,0}; vC = {2,8,0};
p =
{Cross[vA,vB],Cross[vB,vC],Cross[vC,vA],Cross[vA,vB]+Cross[vB,vC]+Cross[vC,vA]}/2
```

```
{{0, 0, 1}, {0, 0, 19}, {0, 0, -13}, {0, 0, 7}}
```

Umlausinn ändern: Negativ, 1+19-13=7

Werte ohne Vorzeichen:

```
Drop[Map[Norm,p],{4}]
```

```
{1, 19, 13}
```

2

```
k1={1,5,6};k1=k1/Norm[k1];k2={2,5,7};k2=k2/Norm[k2];k1+k2
```

$$\left\{\sqrt{\frac{2}{39}}+\frac{1}{\sqrt{62}},\ \frac{5}{\sqrt{62}}+\frac{5}{\sqrt{78}},\ 3\sqrt{\frac{2}{31}}+\frac{7}{\sqrt{78}}\right\}$$

```
%//N
```

```
{0.353456, 1.20114, 1.55459}
```

```
a={3,1,0};b={0,2,1};c={1,0,4};
solv=Solve[k1+k2 == λ a + μ b + ν c, {λ,μ,ν}] //Flatten
```

$$\left\{\lambda\to\frac{39\sqrt{62}+217\sqrt{78}}{60450},\ \mu\to\frac{78\sqrt{62}+59\sqrt{78}}{1950},\ \nu\to\frac{858\sqrt{62}+899\sqrt{78}}{60450}\right\}$$

```
%//N
```

$$\{\lambda\to 0.0367838,\ \mu\to 0.582178,\ \nu\to 0.243104\}$$

```
λ a/.solv[[1]]
```

$$\left\{\frac{39\sqrt{62}+217\sqrt{78}}{20150},\ \frac{39\sqrt{62}+217\sqrt{78}}{60450},\ 0\right\}$$

```
%//N
```

```
{0.110351, 0.0367838, 0.}
```

Norm[%]

0.11632

Norm[%%%]

$$\frac{39\sqrt{62}+217\sqrt{78}}{6045\sqrt{10}}$$

3

a

vA={1,5,6};vB={2,5,7};vC={3,1,0};vD={1,0,4};

V=Det[{vB-vA,vC-vA,vD-vA}]/6

$$-\frac{16}{3}$$

N[%]

-5.33333

b

(Norm[Cross[vB-vA,vD-vA]]+Norm[Cross[vC-vB,vD-vB]]+Norm[Cross[vB-vA,vC-vA]]+Norm[Cross[vC-vA,vD-vA]])/2

$$\frac{1}{2}\left(17\sqrt{6}+\sqrt{710}\right)$$

N[%]

34.1436

c

winkel=ArcCos[(vA-vB).(vC-vB)/(Norm[vA-vB] Norm[vC-vB])]

$$\text{ArcCos}\left[\sqrt{\frac{3}{11}}\right]$$

%//N

1.02133

%/Degree

58.5178

4

a

```
vA={4,5,-6};vB={6,2,-5};vC={2,16,1};
vX[λ_]:=vB+λ(vC-vB);
(vC-vB).(vA-vX[λ])==0
```

$$14\,(3-14\,\lambda)+6\,(-1-6\,\lambda)-4\,(-2+4\,\lambda)==0$$

```
solv= Solve[(vC-vB).(vA-vX[λ])==0,{λ}]//Flatten
```

$$\left\{\lambda\to\frac{11}{62}\right\}$$

```
%//N
```

$$\{\lambda\to 0.177419\}$$

```
vX0=vX[λ]/.solv
```

$$\left\{\frac{164}{31},\ \frac{139}{31},\ -\frac{122}{31}\right\}$$

```
%//N
```

$$\{5.29032,\ 4.48387,\ -3.93548\}$$

b ==> ausserhalb - x-Koordinaten vergleichen....

```
g[μ_]:=vA+ μ (vA-vX0);
g[μ][[3]]==0
```

$$-6-\frac{64\,\mu}{31}==0$$

```
solv=Solve[g[μ][[3]]==0,{μ}]//Flatten
```

$$\left\{\mu\to-\frac{93}{32}\right\}$$

```
g[μ]/.solv
```

$$\left\{\frac{31}{4},\ \frac{7}{2},\ 0\right\}$$

```
%//N
```

$$\{7.75,\ 3.5,\ 0.\}$$