Lösungen

1

F1

$$\left\{12\sqrt{\frac{5}{13}}, 30\sqrt{\frac{5}{13}}, 36\sqrt{\frac{5}{13}}\right\}$$

```
{7.44208, 18.6052, 22.3263}
```

F2

$$\left\{\frac{8}{\sqrt{3}}, \frac{40}{\sqrt{3}}, \frac{56}{\sqrt{3}}\right\}$$

```
{4.6188, 23.094, 32.3316}
```

F1+F2

$$\left\{12\sqrt{\frac{5}{13}}+\frac{8}{\sqrt{3}}, 30\sqrt{\frac{5}{13}}+\frac{40}{\sqrt{3}}, 36\sqrt{\frac{5}{13}}+\frac{56}{\sqrt{3}}\right\}$$

```
{12.0609, 41.6992, 54.6579}
```

$$\begin{pmatrix} 12\sqrt{\frac{5}{13}} & \frac{8}{\sqrt{3}} & 12\sqrt{\frac{5}{13}}+\frac{8}{\sqrt{3}} \\ 30\sqrt{\frac{5}{13}} & \frac{40}{\sqrt{3}} & 30\sqrt{\frac{5}{13}}+\frac{40}{\sqrt{3}} \\ 36\sqrt{\frac{5}{13}} & \frac{56}{\sqrt{3}} & 36\sqrt{\frac{5}{13}}+\frac{56}{\sqrt{3}} \end{pmatrix}$$

```
{{7.44208, 4.6188, 12.0609},
 {18.6052, 23.094, 41.6992},
 {22.3263, 32.3316, 54.6579}}
```

Komponente Richtung a

$$\left\{\lambda \to \frac{2}{169}\left(-52\sqrt{3}+15\sqrt{65}\right), \mu \to \frac{4}{507}\left(884\sqrt{3}+135\sqrt{65}\right), \nu \to \frac{8}{507}\left(247\sqrt{3}+36\sqrt{65}\right)\right\}$$

```
{λ → 0.365293, μ → 20.667, ν → 11.3303}
```

$$\left\{\frac{4}{169}\left(-52\sqrt{3}+15\sqrt{65}\right), \frac{2}{169}\left(-52\sqrt{3}+15\sqrt{65}\right), 0\right\}$$

```
{0.730585, 0.365293, 0.}
```

Norm

$$\frac{2}{169}\sqrt{5}\left(-52\sqrt{3}+15\sqrt{65}\right)$$

```
0.816819
```

2

Out[85]= $(-2+x)^2+(-3+y)^2+(-3+z)^2==36$

$$10+(-3+y)^2==36$$

$$\left\{y\to 3-\sqrt{26},\ y\to 3+\sqrt{26}\right\}$$

```
{y → -2.09902, y → 8.09902}
```

P1

$$\left\{3,\ 3-\sqrt{26},\ 0\right\}$$

P2

$$\left\{3,\ 3+\sqrt{26},\ 0\right\}$$

M

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

d

$$\frac{2\sqrt{65}}{3}$$

```
5.37484
```

3

Ebene (P1, P2, P3), Q1 spiegeln => Schnittpunkt L,, Q2, Volumen (Q1,P1,P2,P3,Q2) = ?

```
P1={0,0,3};
P2={0,6,0};
P3={5,0,0};
Q1={2,4,0};
```

Winkel zwischen P1Q1 und P1Q2 ?

---

a

Punkte

```
P1={0,0,3};P2={0,6,0};P3={5,0,0};Q1={2,4,0};
```

Gerade

Out[94]= $\{2 - 18\,\lambda,\ 4 - 15\,\lambda,\ -30\,\lambda\}$

Ebene

Out[93]= $\{5\,\nu,\ 6\,\mu,\ 3 - 3\,\mu - 3\,\nu\}$

Schnittpunkt

Out[95]= $\left\{\lambda \to \frac{2}{483},\ \mu \to \frac{317}{483},\ \nu \to \frac{62}{161}\right\}$

$\left\{\frac{310}{161},\ \frac{634}{161},\ -\frac{20}{161}\right\}$

$\{1.92547,\ 3.93789,\ -0.124224\}$

---

b

Q2

$\left\{\frac{298}{161},\ \frac{624}{161},\ -\frac{40}{161}\right\}$

$\{1.85093,\ 3.87578,\ -0.248447\}$

---

c

V

2

d

Flächeninhalt

$$\frac{3\sqrt{161}}{2}$$

19.0329

e

Winkelgrösse

$$\text{ArcCos}\left[\frac{4661}{4669}\right]$$

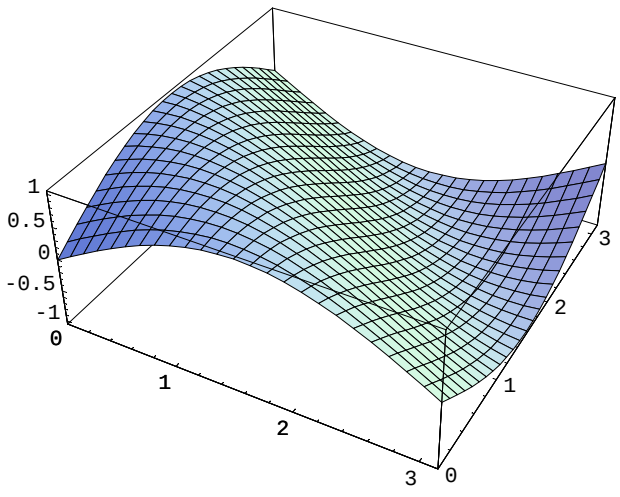
0.0585477

In Grad

3.35454

4

a



b

Tangentialebene

$$\left\{\frac{\pi}{2}+\lambda,\ \frac{\pi}{2}+\mu,\ \lambda\,\text{Cos}[x+y]+\mu\,\text{Cos}[x+y]+\text{Sin}[x+y]\right\}$$

Durchstosspunkt

$$\{0,\ 0,\ \pi\}$$

$$\{0.,\ 0.,\ 3.14159\}$$

c

Kreuzprodukt der Tangentialvektoren

$$\{-\text{Cos}[x+y],\ -\text{Cos}[x+y],\ 1\}$$

Norm

$$\sqrt{1+2\,\text{Cos}[x+y]^2}$$

Integral (Flächeninhalt)

13.7252

d

Norm des Tangentialvektors in beiden Richtungen

Out[97]= $\sqrt{1+\text{Cos}[x+y]^2}$

$$\sqrt{1+\text{Cos}[x+y]^2}$$

Die 4 Teillängen

3.8202

```
3.8202
```

```
3.8202
```

```
3.8202
```

Gesamtlänge

```
15.2808
```