Lösungen

1

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

a

```
Series[E^(-x^2),{x,0,8}]
```

$$1 - x^2 + \frac{x^4}{2} - \frac{x^6}{6} + \frac{x^8}{24} + O[x]^9$$

```
N[%]
```

$$1. - (x + 0.)^2 + 0.5\,(x + 0.)^4 - 0.166667\,(x + 0.)^6 + 0.0416667\,(x + 0.)^8 + O[x + 0.]^9$$

b

```
Evaluate[Normal[Series[E^(-x^2),{x,0,8}]]]
```

$$1 - x^2 + \frac{x^4}{2} - \frac{x^6}{6} + \frac{x^8}{24}$$

```
N[%]
```

$$1. - 1.\,x^2 + 0.5\,x^4 - 0.166667\,x^6 + 0.0416667\,x^8$$

```
Integrate[Evaluate[Normal[Series[E^(-x^2),{x,0,8}]]],{x,-2,2}]
```

$$\frac{3508}{945}$$

```
%//N
```

```
3.71217
```

```
Integrate[E^(-x^2),{x,-2,2}]//N
```

```
1.76416
```

```
Integrate[Evaluate[Normal[Series[E^(-x^2),{x,0,100}]]],{x,-2,2}]//N
```

```
1.76416
```

c

```
Evaluate[Normal[Series[Cos[x^2]+E^(x^2),{x,0,8}]]]
```

$$2 + x^2 + \frac{x^6}{6} + \frac{x^8}{12}$$

```
N[%]
```

$$2. + x^2 + 0.166667\, x^6 + 0.0833333\, x^8$$

```
Integrate[Evaluate[Normal[Series[E^(-x^2),{x,0,8}]]],{x,-2,2}]
```

$$\frac{3508}{945}$$

```
%//N
```

3.71217

```
Integrate[E^(-x^2),{x,-2,2}]//N
```

1.76416

```
Integrate[Evaluate[Normal[Series[E^(-x^2),{x,0,100}]]],{x,-2,2}]//N
```

1.76416

d

```
Evaluate[Normal[Series[Sqrt[x],{x,1,6}]]]
```

$$1 + \frac{1}{2}(-1+x) - \frac{1}{8}(-1+x)^2 + \frac{1}{16}(-1+x)^3 - \frac{5}{128}(-1+x)^4 + \frac{7}{256}(-1+x)^5 - \frac{21(-1+x)^6}{1024}$$

```
N[%]
```

$$1. + 0.5\,(-1.+x) - 0.125\,(-1.+x)^2 + 0.0625\,(-1.+x)^3 - 0.0390625\,(-1.+x)^4 + 0.0273438\,(-1.+x)^5 - 0.0205078\,(-1.+x)^6$$

e

```
r=1
```

1

f

```
Evaluate[Normal[Series[Log[x]-Sin[x],{x,1,6}]]]
```

$$(-1+x)(1-\text{Cos}[1]) + (-1+x)^5\left(\frac{1}{5} - \frac{\text{Cos}[1]}{120}\right) + (-1+x)^3\left(\frac{1}{3} + \frac{\text{Cos}[1]}{6}\right) + (-1+x)^4\left(-\frac{1}{4} - \frac{\text{Sin}[1]}{24}\right) + (-1+x)^6\left(-\frac{1}{6} + \frac{\text{Sin}[1]}{720}\right) + (-1+x)^2\left(-\frac{1}{2} + \frac{\text{Sin}[1]}{2}\right) - \text{Sin}[1]$$

```
N[%]
```

$$-0.841471 + 0.459698\,(-1. + x) - 0.0792645\,(-1. + x)^2 + 0.423384\,(-1. + x)^3 - 0.285061\,(-1. + x)^4 + 0.195497\,(-1. + x)^5 - 0.165498\,(-1. + x)^6$$

g

```
1-1/(1-1/2)+1/(1-1/3)
```

$$\frac{1}{2}$$

```
N[%]
```

```
0.5
```

2

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

a

```
p1 = {1, 2, 3}; p2 = {3, 4, 2}; p3 = {8, 8, 10}; p4 = {4, 0, -2};
```

```
Det[{p4 - p1, p3 - p1, p2 - p1}] / 6
```

$$-\frac{56}{3}$$

```
% // N
```

```
-18.6667
```

b

```
(Norm[Cross[p4 - p1, p3 - p1]] + Norm[Cross[p4 - p1, p2 - p1]] +
   Norm[Cross[p3 - p1, p2 - p1]] +
   Norm[Cross[p3 - p4, p2 - p4]]) / 2
```

$$\frac{1}{2}\left(13\sqrt{5} + 8\sqrt{69} + 4\sqrt{101} + \sqrt{293}\right)$$

```
% // N
```

```
76.4193
```

c

```
p1 = {1, 2, 3}; p2 = {3, 4, 2}; p3 = {8, 8, 10}; p4 = {4, 0, -2};
```

```
(p1 + p2 + p3) / 3
```

$$\left\{4, \frac{14}{3}, 5\right\}$$

```
% // N
```

```
{4., 4.66667, 5.}
```

```
p1 + (p2 - p1) / 2 + (p3 - (p1 + (p2 - p1) / 2)) / 3
```

$$\left\{4, \frac{14}{3}, 5\right\}$$

```
% // N
```

```
{4., 4.66667, 5.}
```

```
p1 + (p2 - p1) / 2 + (p3 - (p1 + (p2 - p1) / 2)) / 3 +
  (p4 - (p1 + (p2 - p1) / 2 + (p3 - (p1 + (p2 - p1) / 2)) / 3)) / 4
```

$$\left\{4, \frac{7}{2}, \frac{13}{4}\right\}$$

```
% // N
```

```
{4., 3.5, 3.25}
```

```
(p1+p2+p3+p4)/4
```

$$\left\{4, \frac{7}{2}, \frac{13}{4}\right\}$$

```
%//N
```

```
{4., 3.5, 3.25}
```

d

```
Det[{p4 - p1, p3 - p1, p2 - p1}] / Norm[Cross[p3 - p1, p2 - p1]]
```

$$-\frac{112}{13\sqrt{5}}$$

```
% // N
```

```
-3.85292
```

3

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

a

```
p1={1,2,3}; p2={3,4,2}; p3={8,8,10}; p4={4,0,-2};
```

```
a = {7, 10, 7}; b = {-2, -2, 1};
```

```
Det[{p3 - p1, p2 - p1, a}]
```

```
84
```

Gerade durchstösst Ebene

```
Det[{p3 - p1, p2 - p1, b}]
```

```
0
```

Es existiert eine Schnittgerade

b

```
a1 = {7,10}; b1 = {-2,-2};
```

i

```
a11={-10,7};
```

ii

```
ArcCos[a1.b1/(Norm[a1] Norm[b1])]
```

$$\text{ArcCos}\left[-\frac{17}{\sqrt{298}}\right]$$

```
φ1=ArcCos[a1.b1/(Norm[a1] Norm[b1])] /Degree //N
```

```
169.992
```

```
φ = φ1 + 90 - 12
```

```
247.992
```

```
360-φ
```

```
112.008
```

iii

```
dreh[φ_]:={{Cos[φ],-Sin[φ]},{Sin[φ],Cos[φ]}};
dreh[u]//MatrixForm
```

$$\begin{pmatrix} \text{Cos}[u] & -\text{Sin}[u] \\ \text{Sin}[u] & \text{Cos}[u] \end{pmatrix}$$

```
dreh[90 Degree].{{1},{1}}
```

```
{{-1}, {1}}
```

```
dreh[12 Degree].Transpose[{b1}]
```

```
{{-2 Cos[12 °] + 2 Sin[12 °]}, {-2 Cos[12 °] - 2 Sin[12 °]}}
```

```
%//N //MatrixForm
```

$$\begin{pmatrix} -1.54047 \\ -2.37212 \end{pmatrix}$$

4

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

a

```
A = {{1,2},{-1,4}};  B = {{3,3},{1,4}};
Print[A//MatrixForm];
Print[B//MatrixForm];
```

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

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

```
X = Inverse[Transpose[A]].A.Inverse[B]//MatrixForm
```

$$\begin{pmatrix} 0 & \frac{1}{2} \\ -\frac{2}{9} & \frac{1}{6} \end{pmatrix}$$

```
%//N//MatrixForm
```

$$\begin{pmatrix} 0. & 0.5 \\ -0.222222 & 0.166667 \end{pmatrix}$$

b

```
Inverse[A]//MatrixForm
```

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

5

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

a

```
Cm = {{1,2,3},{0,1,1},{2,1,0}};
Print[Cm//MatrixForm];
```

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

```
Det[Cm]
```

```
-3
```

b

Nein, wegen a)

c

```
Dm = {{1,2,3,4},{0,1,2,2},{2,1,0,4},{2,1,1,0}};
Print[Dm//MatrixForm];
```

$$\begin{pmatrix} 1 & 2 & 3 & 4 \\ 0 & 1 & 2 & 2 \\ 2 & 1 & 0 & 4 \\ 2 & 1 & 1 & 0 \end{pmatrix}$$

```
Det[Dm]
```

```
-2
```

Zusatz

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

```
solv=DSolve[{f''[t] + f[t]== 0, f[0]== 2,f'[0]==0},f,t]//Flatten
```

```
{f → Function[{t}, 2 Cos[t]]}
```

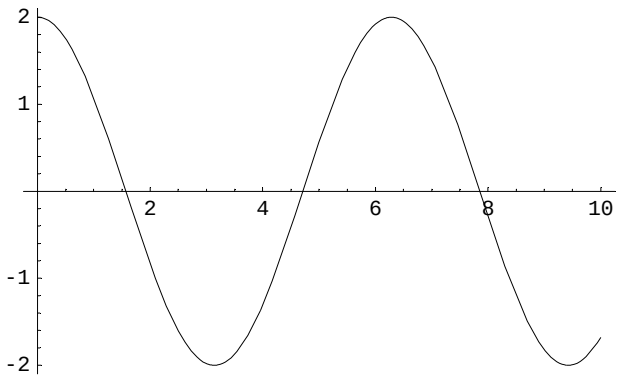
```
f=f/.solv
```

```
Function[{t}, 2 Cos[t]]
```

```
f[x]//Simplify
```

```
2 Cos[x]
```

```
Plot[f[x],{x,0,10}];
```



Anhang

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

```
p1={1,2,3};
p2={3,4,2};
p3=2(p1+p2)
```

```
{8, 12, 10}
```

```
p3={8,8,10}
```

```
{8, 8, 10}
```

```
p4=2(p2-p1)
```

```
{4, 4, -2}
```

```
p4={4,0,-2}
```

```
{4, 0, -2}
```

```
Volumen=1/6 Det[{p2-p1,p3-p1,p4-p1}]
```

$$\frac{56}{3}$$

```
a1=p3-p1
```

```
{7, 6, 7}
```

```
b1=p2-p1
```

```
{2, 2, -1}
```

```
Det[{{1,2,3},{0,1,1},{2,1,0}}]
```

```
-3
```

```
Det[{{1,2,3,4},{0,1,2,-2},{2,1,0,4},{2,1,1,0}}]
```

```
10
```