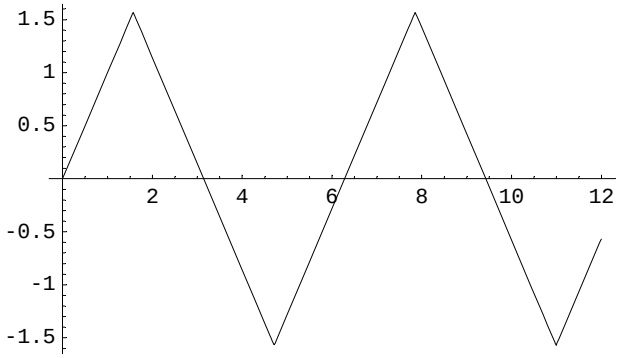
Lösungen

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

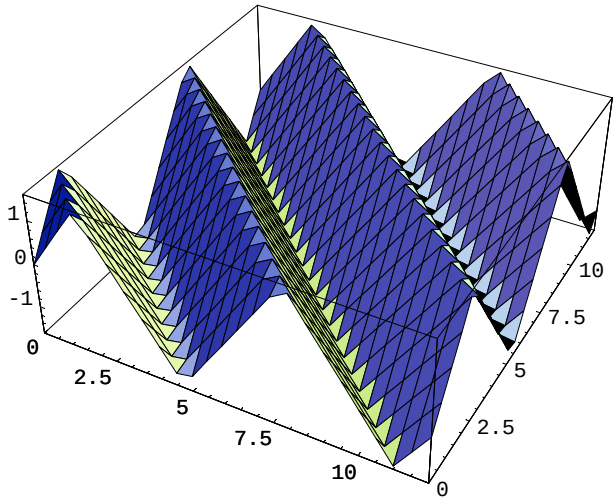
1

a

```
Plot[ArcSin[Sin[x]],{x,0,12}];
```

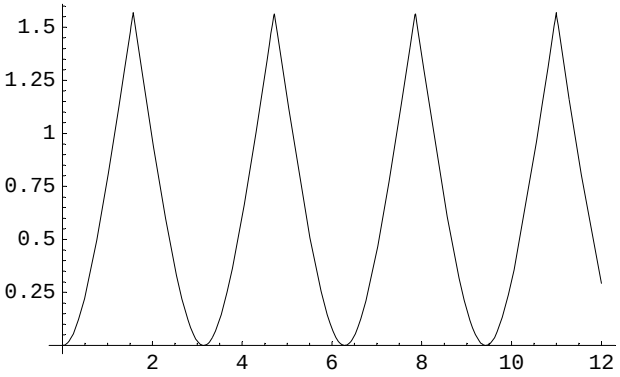



```
Plot3D[ArcSin[Sin[x+y]],{x,0,12},{y,0,12}];
```

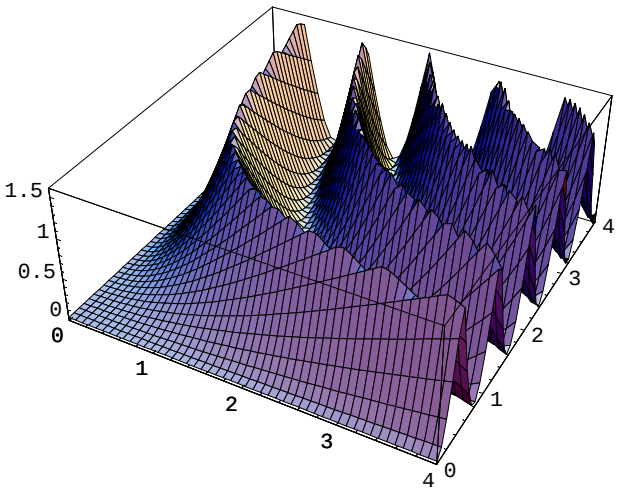


b

```
Plot[ArcSin[Sin[x]^2],{x,0,12}];
```

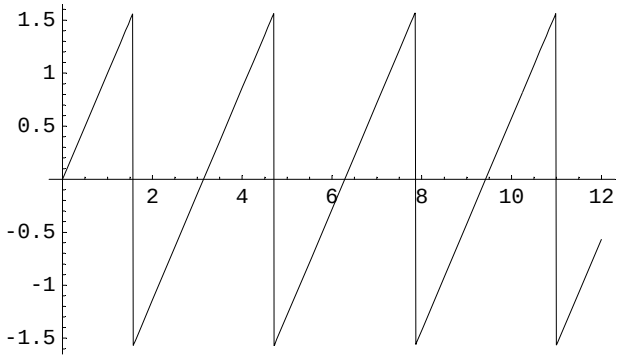



```
Plot3D[ArcSin[Sin[x y]^2],{x,0,4},{y,0,4},PlotPoints->50];
```

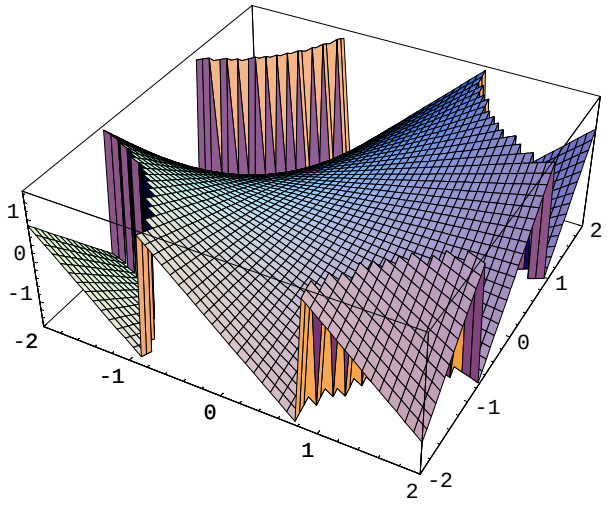


c

```
Plot[ArcTan[Tan[x]],{x,0,12}];
```



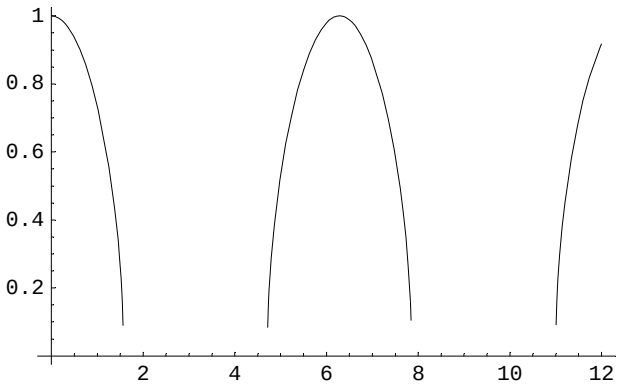
```
Plot3D[ArcTan[Tan[x y]],{x,-2,2},{y,-2,2},PlotPoints->50];
```



d

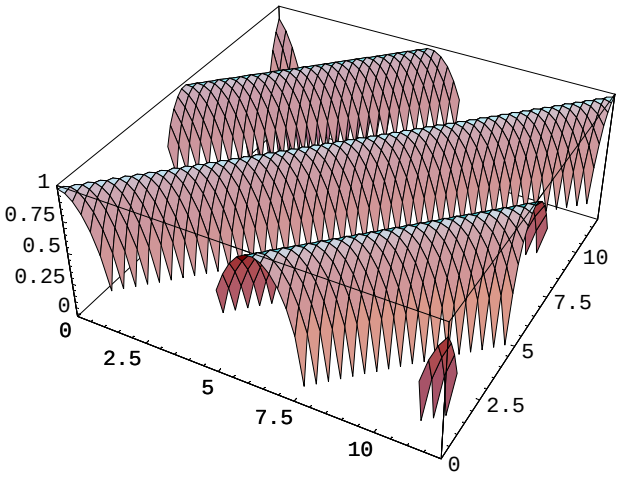
```
Plot[Sqrt[Cos[x]],{x,0,12}];
```

```
Plot::plnr : √Cos[x] is not a machine-size real number at x = 2.0228718763747793`. Mehr…

Plot::plnr : √Cos[x] is not a machine-size real number at x = 1.760542994200739`. Mehr…

Plot::plnr : √Cos[x] is not a machine-size real number at x = 1.644337863925258`. Mehr…

General::stop : Further output of Plot::plnr will be suppressed during this calculation. Mehr…
```



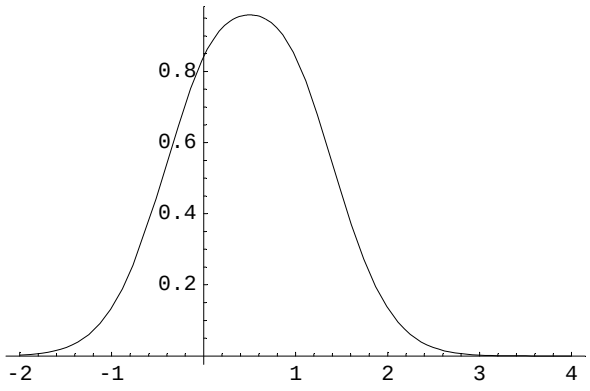
```
Plot3D[Sqrt[Cos[x - y]],{x,0,12},{y,0,12},PlotPoints->50];
```

```
Plot3D::gval : Function value 0. + 0.37815 i at grid point xi = 1, yi = 8 is not a real number. Mehr…

Plot3D::gval : Function value 0. + 0.615383 i at grid point xi = 1, yi = 9 is not a real number. Mehr…

Plot3D::gval : Function value 0. + 0.769283 i at grid point xi = 1, yi = 10 is not a real number. Mehr…

General::stop : Further output of Plot3D::gval will be suppressed during this calculation. Mehr…
```

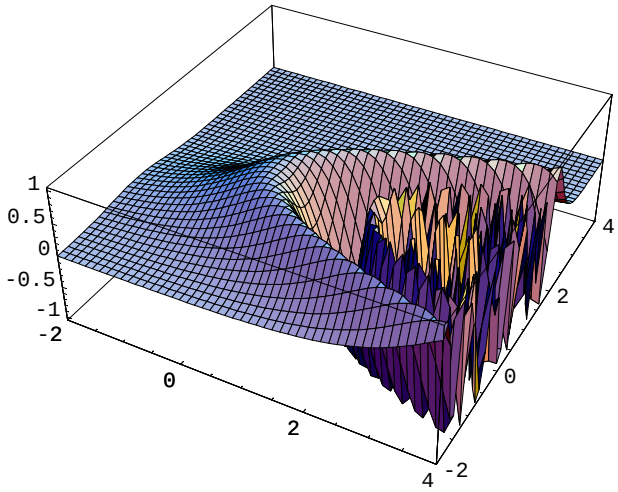


e

```
Plot[Sin[E^(x-x^2)],{x,-2,4}];
```

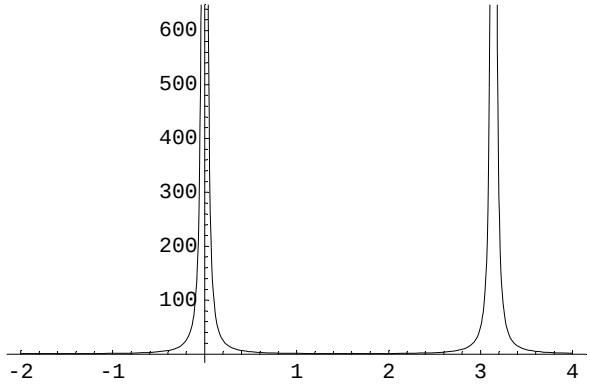


```
Plot3D[Sin[E^(x-y^2)],{x,-2,4},{y,-2,4},PlotPoints->50];
```

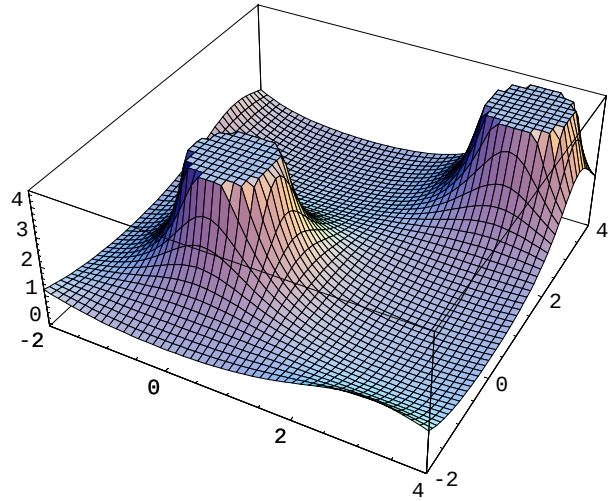


f

```
Plot[1/(1-Cos[x]^2),{x,-2,4}];
```




```
Plot3D[1/(1-Cos[x]Cos[y]),{x,-2,4},{y,-2,4},PlotPoints->50];
```



2

```
Remove["Global`*"]

grad[f_,x_,y_]:= {D[f,x],D[f,y]}
```

a

```
f[x_,y_]:=1-x^2-y^2;
grad[f[x,y],x,y]
```

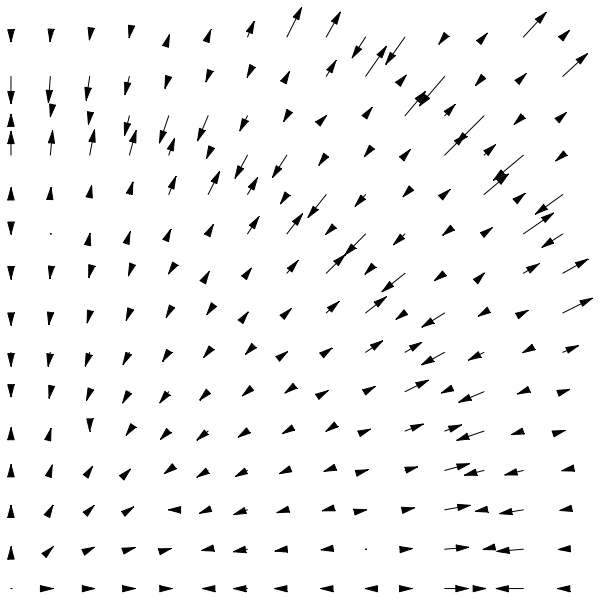
$$\{-2\,x,\ -2\,y\}$$

b

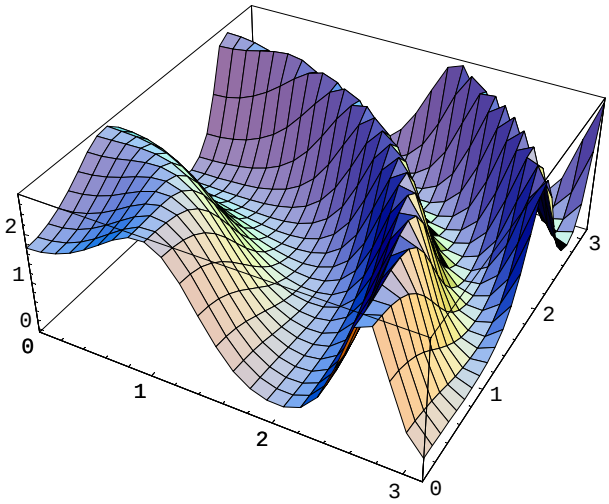
```
f[x_,y_]:=E^(Cos[1-x^2-y^2]);
grad[f[x,y],x,y]
```

$$\left\{2\,e^{\text{Cos}[1-x^2-y^2]}\,x\,\text{Sin}[1-x^2-y^2],\ 2\,e^{\text{Cos}[1-x^2-y^2]}\,y\,\text{Sin}[1-x^2-y^2]\right\}$$

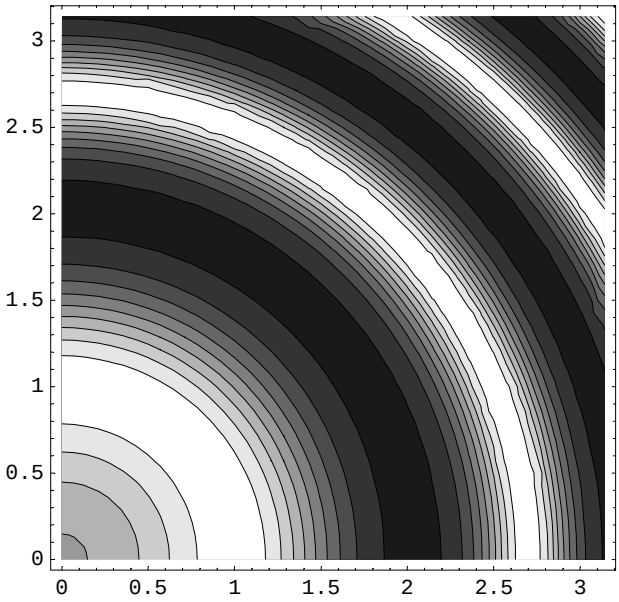
```
<<Graphics`PlotField`

p1=PlotVectorField[Evaluate[grad[f[x,y],x,y]],
             {x, 0, Pi}, {y, 0, Pi}];
```



```
p2=Plot3D[f[x,y],{x, 0, Pi}, {y, 0, Pi}];
```

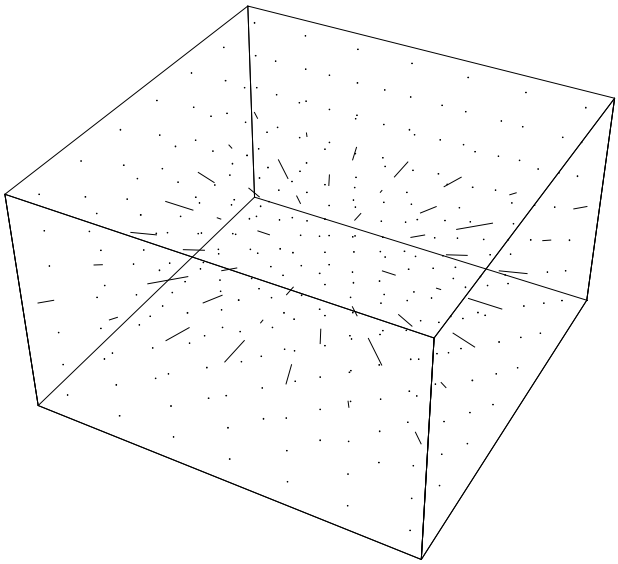



```
p3=ContourPlot[f[x,y],{x, 0, Pi}, {y, 0, Pi},PlotPoints->45];
```

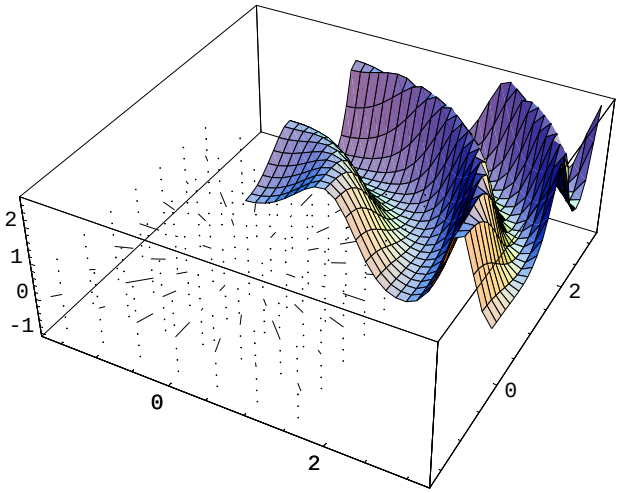



```
<<Graphics`PlotField3D`
```

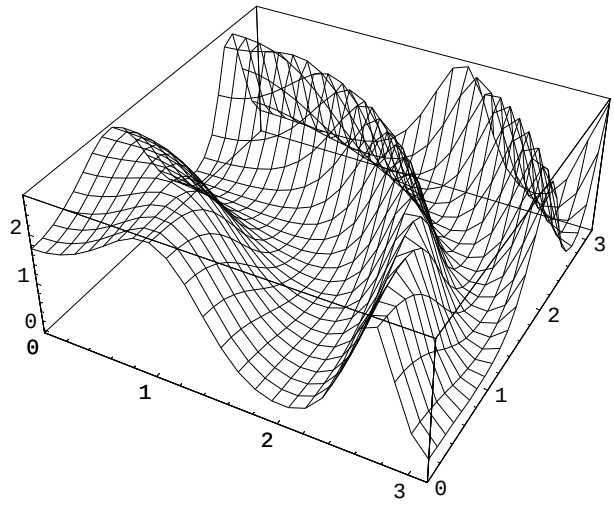
```
p4=PlotVectorField3D[Evaluate[Append[grad[f[x,y],x,y],0](1-Sign[z]^2)], {x,
-Pi/2,Pi/2}, {y, -Pi/2,Pi/2}, {z, -1,1}];
```



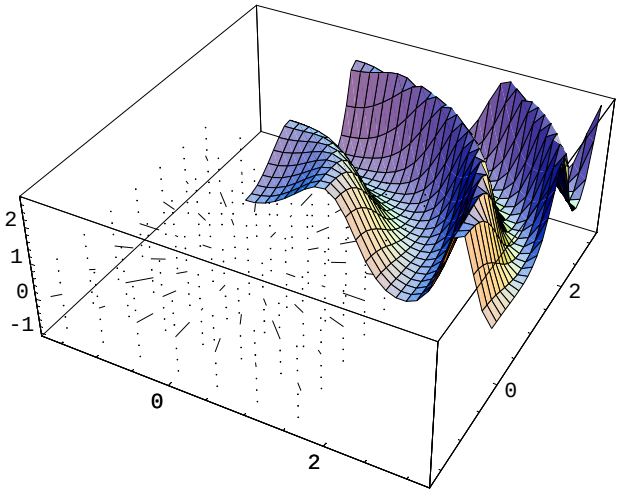
```
Show[p2,p4];
```



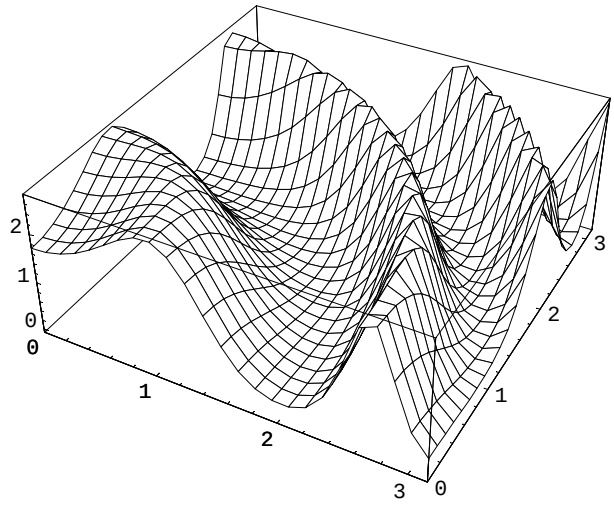

```
p2=Plot3D[f[x,y],{x, 0, Pi}, {y, 0, Pi},HiddenSurface→False];
```



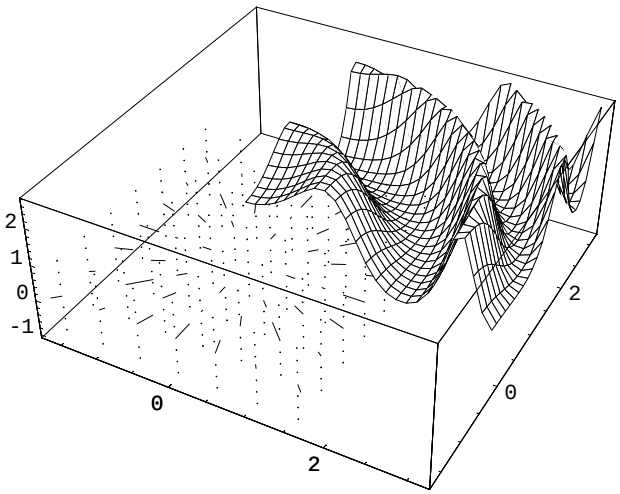
```
Show[p2,p4];
```




```
p2=Plot3D[f[x,y],{x, 0, Pi}, {y, 0, Pi},
Shading→False];
```




```
Show[p2,p4];
```



3 Richtungsableitung im letzten Beispiel

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

```
grad[f_,x_,y_]:= {D[f,x],D[f,y]}
```

```
f[x_,y_]:=E^(Cos[1-x^2-y^2]);
```

```
grad[f[x,y],x,y]/.{x->1,y->1}//N
```

```
{-2.88881, -2.88881}
```

```
RichtungsAbleitung = 1/Sqrt[2] {1,1} . %
```

```
-4.0854
```

```
r[t_]:=1/Sqrt[2] {1,1}.grad[f[x,y],x,y]/.{x->t,y->t}
```

```
r[t]
```

$$2\sqrt{2}\ e^{\text{Cos}[1-2t^2]}\ t\ \text{Sin}[1-2t^2]$$

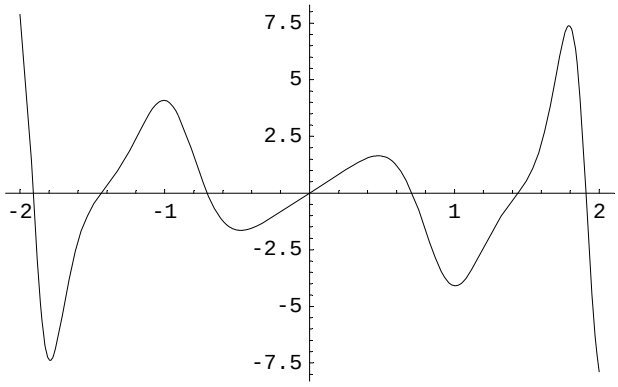
```
Evaluate[r[1]]
```

$$-2\sqrt{2}\ e^{\text{Cos}[1]}\ \text{Sin}[1]$$

```
%//N
```

```
-4.0854
```

```
Plot[Evaluate[r[t]],{t,-2,2}];
```



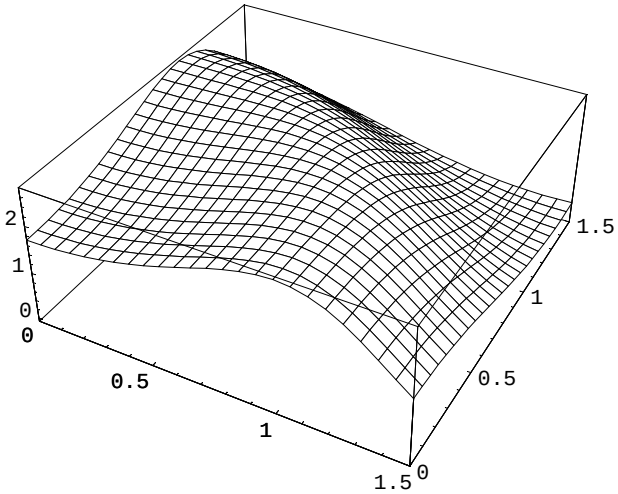
3

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

```
grad[f_,x_,y_]:= {D[f,x],D[f,y]}
```

```
f[x_,y_]:=E^(Cos[1-x^2-y^2]);
```

```
p2=Plot3D[f[x,y],{x, 0,1.5}, {y, 0,1.5},
Shading→False];
```

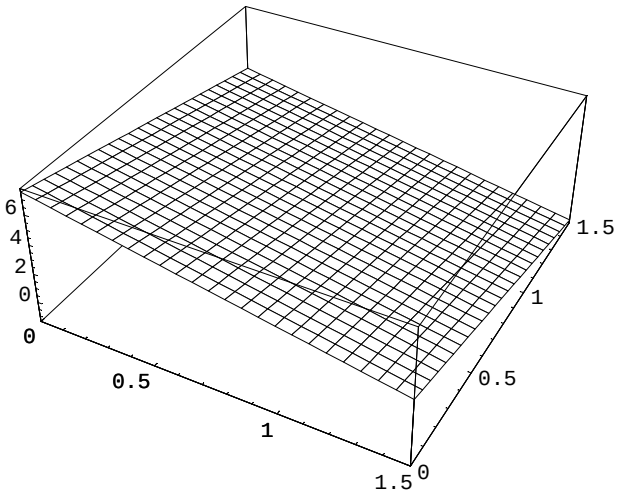



```
m = grad[f[x,y],x,y]/.{x->1,y->1}//N
```

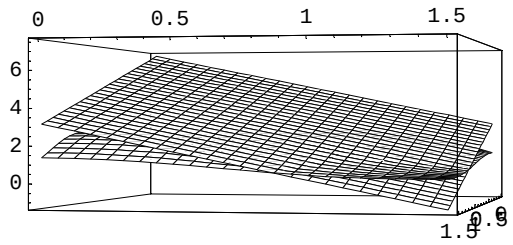
```
{-2.88881, -2.88881}
```

```
TangEbene11[x_,y_]:= f[1,1] + m[[1]] (x-1) + m[[2]] (y-1)
```

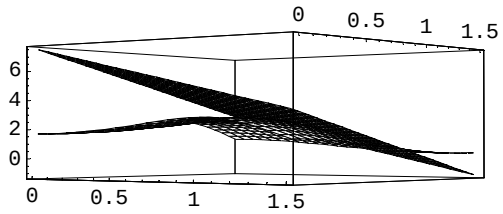
```
p5=Plot3D[TangEbene11[x,y],{x, 0,1.5}, {y, 0,1.5},
Shading→False];
```



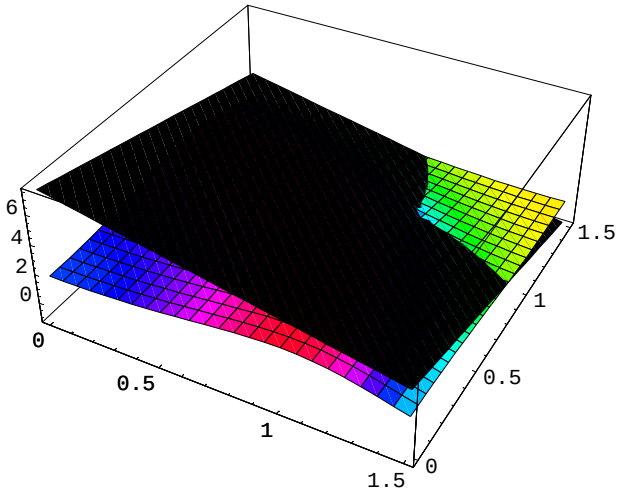

```
Show[p2,p5, ViewPoint->{4.562, 0.997, 0.007}];
```



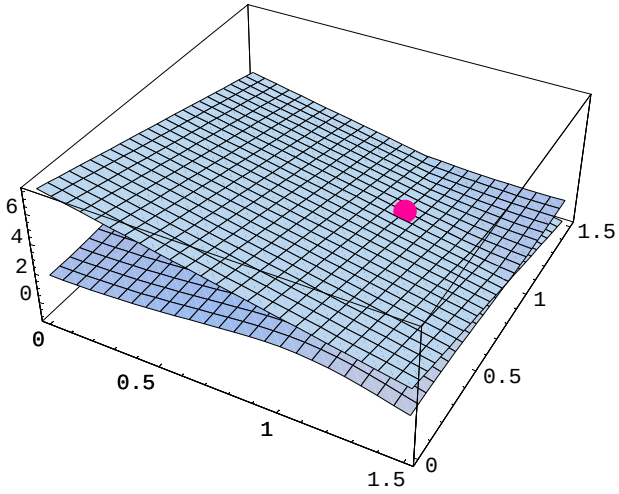
```
Show[p2,p5, ViewPoint->{2.866, -3.686, -0.086}];
```




```
p5=Plot3D[TangEbene11[x,y],{x, 0,1.5}, {y, 0,1.5}, DisplayFunction->Identity];
p2=Plot3D[f[x,y],{x, 0,1.5}, {y, 0,1.5}, DisplayFunction->Identity,Lighting→
False,ColorFunction→Hue];

Show[p2,p5,DisplayFunction -> $DisplayFunction];
```




```
p5=Plot3D[TangEbene11[x,y],{x, 0,1.5}, {y, 0,1.5}, DisplayFunction->Identity];
p2=Plot3D[f[x,y],{x, 0,1.5}, {y, 0,1.5}, DisplayFunction->Identity];

Show[p5,p2,
Graphics3D[{Hue[.9],PointSize[0.04],Point[{1,1,f[1,1]}]}]
,DisplayFunction -> $DisplayFunction];
```



4

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

```
Solve[1/f==1/g+1/b,{b}]//InputForm
```

```
{{b -> -((f*g)/(f - g))}}
```

```
b[f_,g_]:=-((f*g)/(f - g))
```

```
b[7,21.5]
```

```
10.3793
```

```
Fehlerb[f_,Df_,g_,Dg_]:= Abs[Evaluate[D[b[f,g],f]]] Abs[Df] +
Abs[Evaluate[D[b[f,g],g]]] Abs[Dg]
```

```
Fehlerb[f,Df,g,Dg]
```

$$\text{Abs}[\text{Dg}]\ \text{Abs}\left[-\frac{f}{f-g}-\frac{f\,g}{(f-g)^2}\right]+\text{Abs}[\text{Df}]\ \text{Abs}\left[\frac{f\,g}{(f-g)^2}-\frac{g}{f-g}\right]$$

```
Fehlerb[f,Df,g,Dg]/. {f->7, Df->0.2, g->21.5, Dg->0.4}
```

```
0.532937
```