

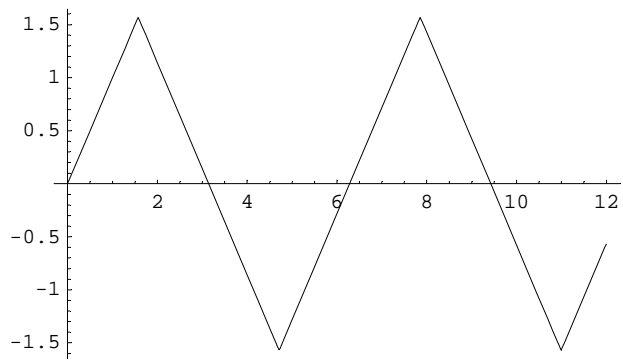
Lösungen

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

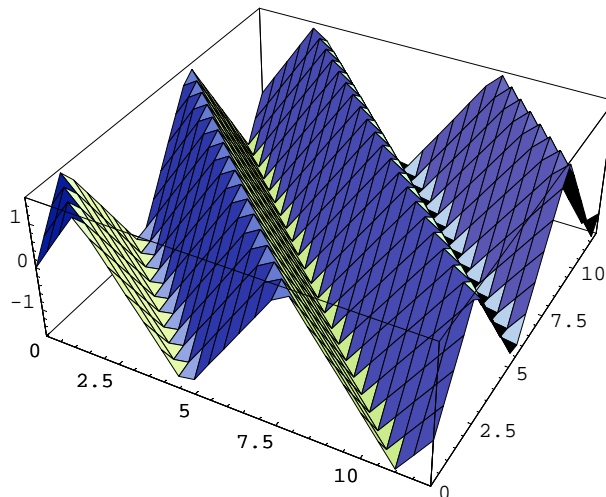
1

a

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

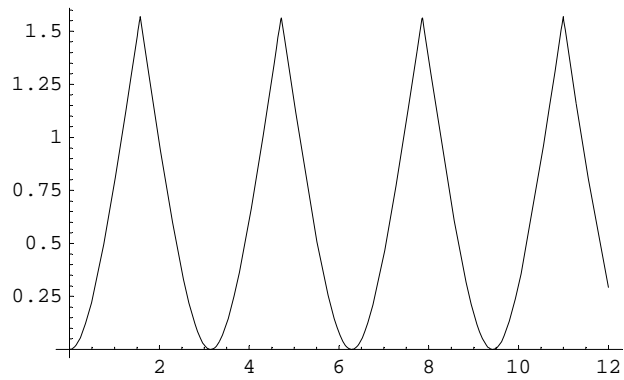


```
Plot3D[ArcSin[Sin[x+y]],{x,0,12},{y,0,12}];
```

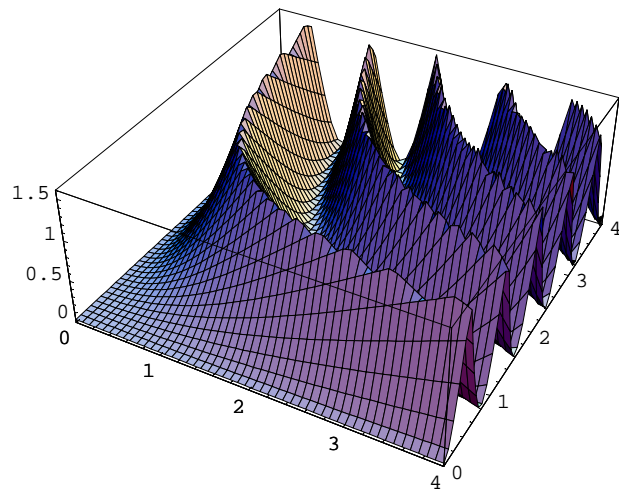


b

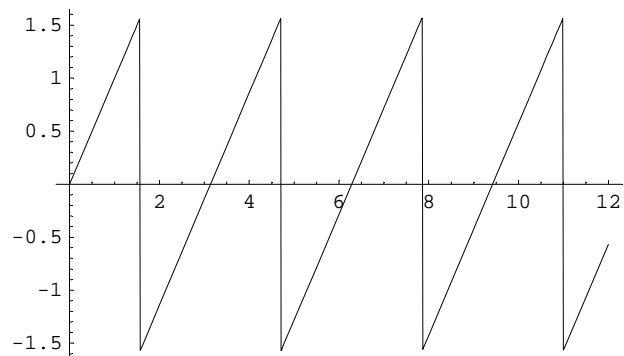
```
Plot[ArcSin[Sin[x]^2],{x,0,12}];
```



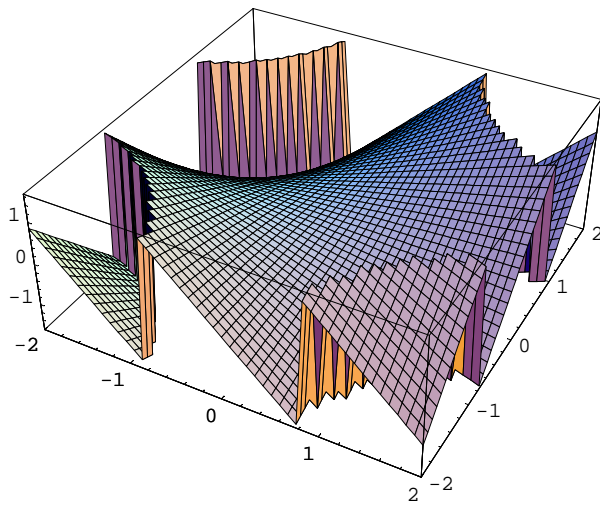
```
Plot3D[ArcSin[Sin[x y]^2],{x,0,4},{y,0,4},PlotPoints->50];
```

**c**

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



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



d

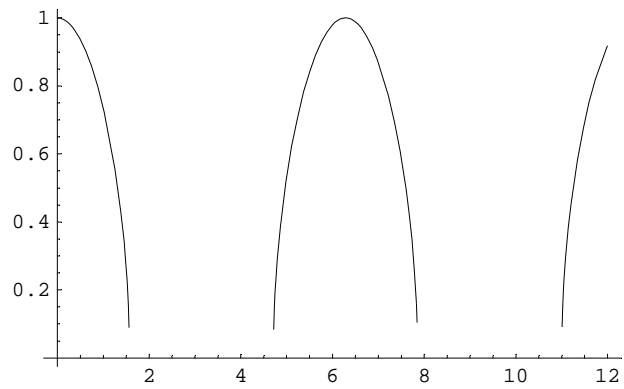
```
Plot[Sqrt[Cos[x]],{x,0,12}];
```

Plot::plnr : $\sqrt{\cos[x]}$ is not a machine-size real number at $x = 2.0228718763747793$. Mehr...

Plot::plnr : $\sqrt{\cos[x]}$ is not a machine-size real number at $x = 1.760542994200739$. Mehr...

Plot::plnr : $\sqrt{\cos[x]}$ 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...



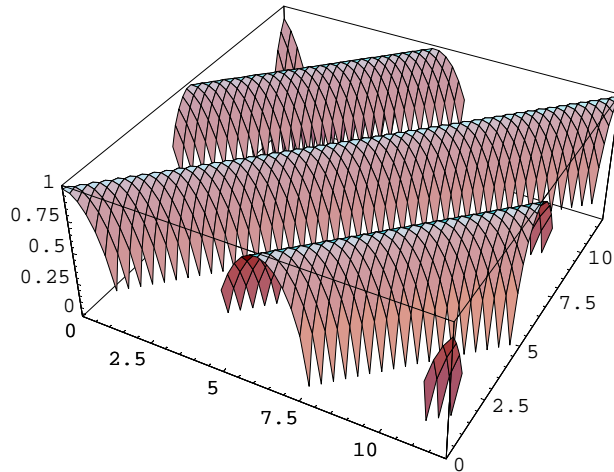
```
Plot3D[Sqrt[Cos[x - y]],{x,0,12},{y,0,12},PlotPoints->50];
```

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

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

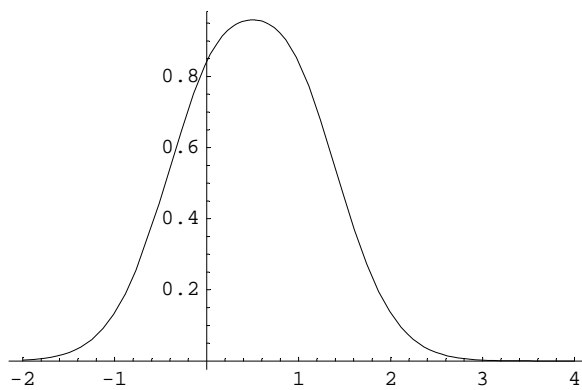
Plot3D::gval : Function value 0.+0.769283i at grid point xi = 1, yi = 10 is not a real number. Mehr...

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

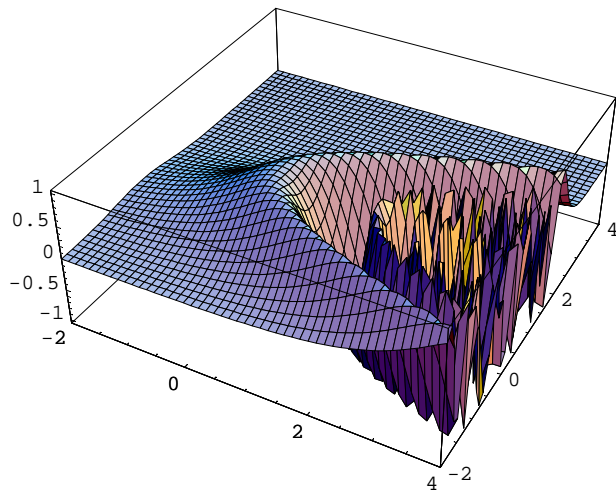


e

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

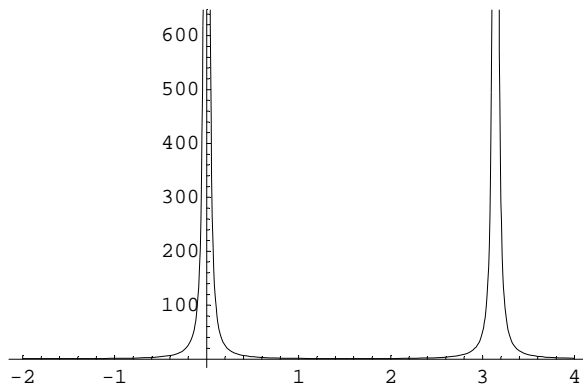


```
Plot3D[Sin[E^(x-y^2)], {x, -2, 4}, {y, -2, 4}, PlotPoints -> 50];
```

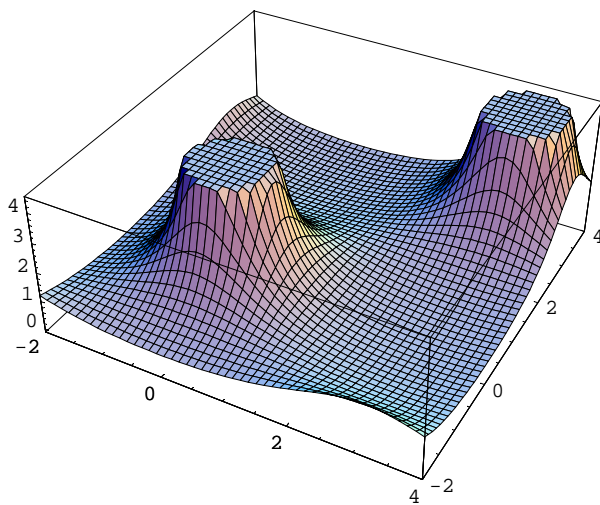


f

```
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

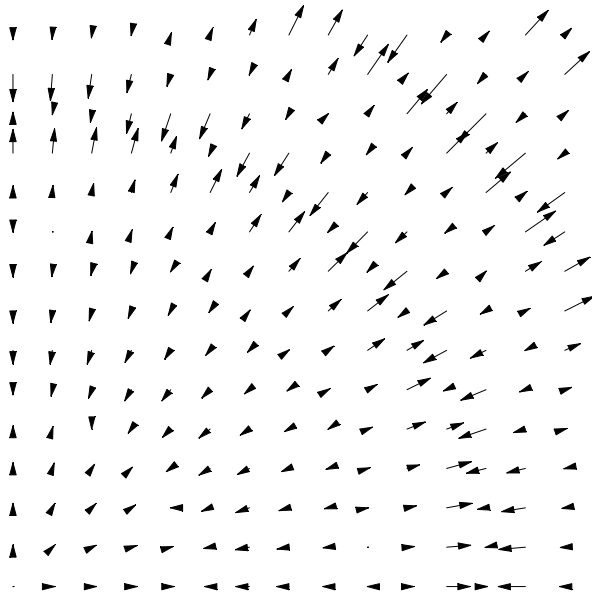
```
Remove["Global`*"]
grad[f_,x_,y_]:= {D[f,x],D[f,y]}
```

a

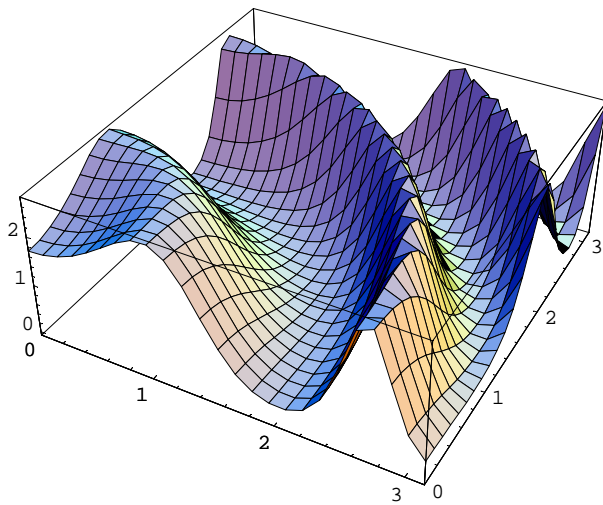
```
f[x_,y_]:=1-x^2-y^2;
grad[f[x,y],x,y]
{-2 x, -2 y}
```

b

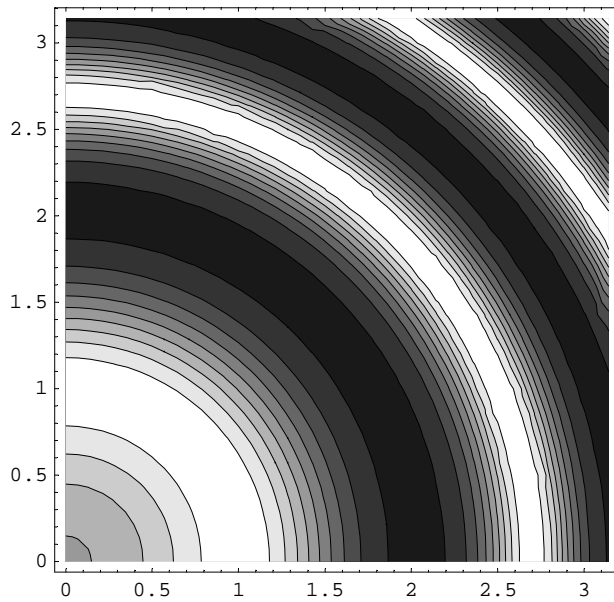
```
f[x_,y_]:=E^(Cos[1-x^2-y^2]);
grad[f[x,y],x,y]
{2 e^Cos[1-x^2-y^2] x Sin[1-x^2-y^2], 2 e^Cos[1-x^2-y^2] y Sin[1-x^2-y^2]}
<<Graphics`PlotField`
p1=PlotVectorField[Evaluate[grad[f[x,y],x,y]],
  {x, 0, Pi}, {y, 0, Pi}];
```



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

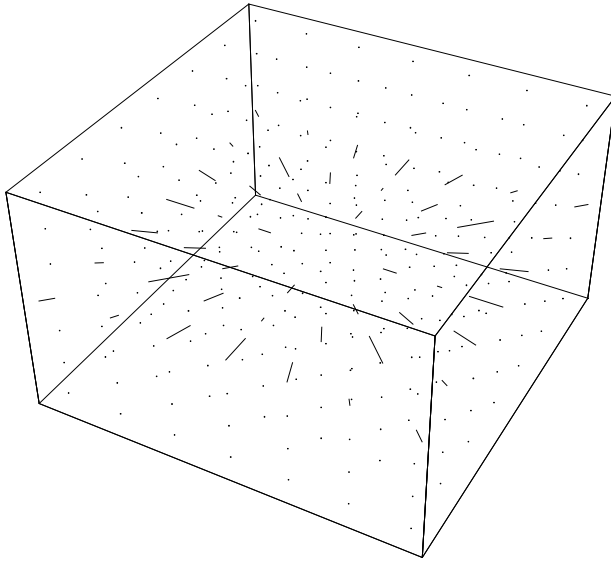


```
p3=ContourPlot[f[x,y],{x, 0, Pi}, {y, 0, Pi},PlotPoints->45];
```

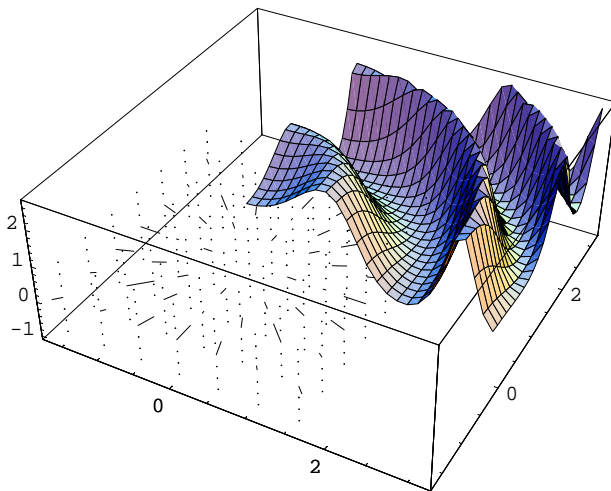


```
<<Graphics`PlotField3D`
```

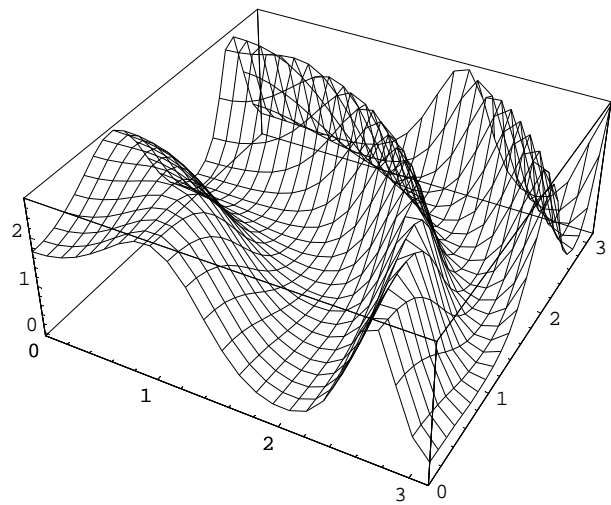
```
p4=PlotVectorField3D[Evaluate[Append[grad[f[x,y],x,y],0](1-Sign[z]^2)], {x,  
-Pi/2,Pi/2}, {y, -Pi/2,Pi/2}, {z, -1,1}];
```



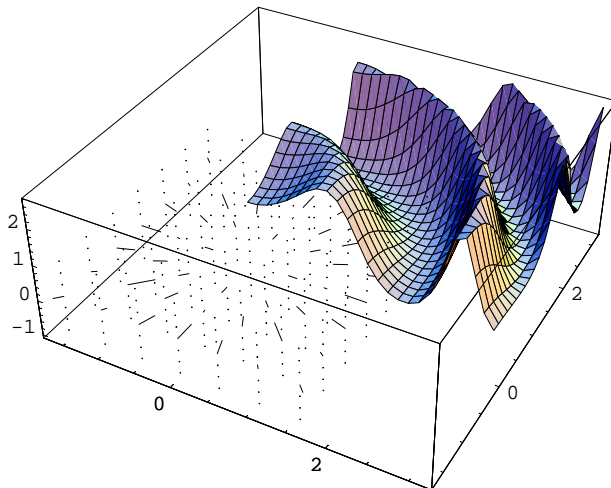
```
Show[p2,p4];
```



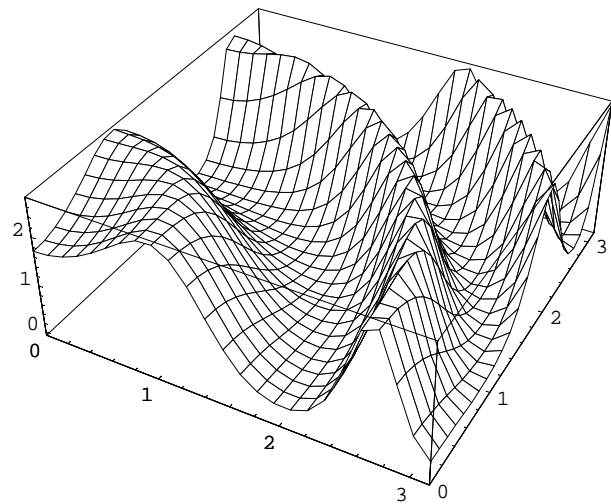
```
p2=Plot3D[f[x,y],{x, 0, Pi}, {y, 0, Pi},HiddenSurface->False];
```



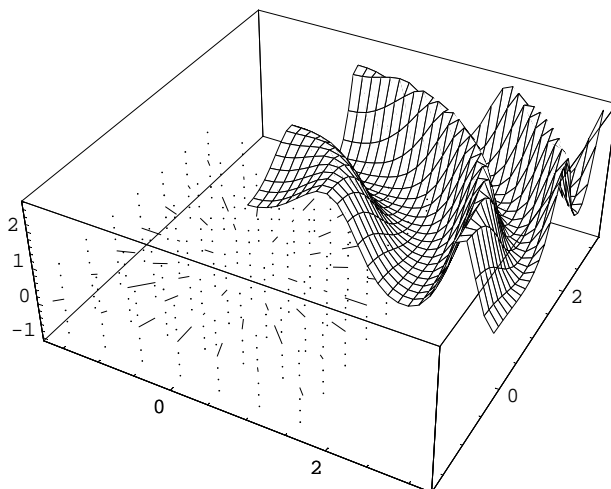

```
Show[p2,p4];
```



```
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^Cos[1-2 t^2] t Sin[1-2 t^2]

Evaluate[r[1]]

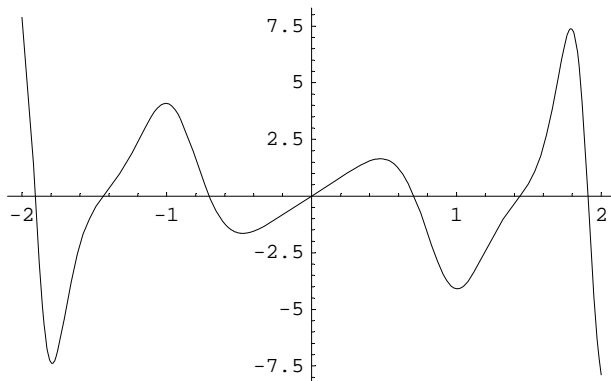
-2 Sqrt[2] e^Cos[1] Sin[1]

%/N

-4.0854

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

```



3

```

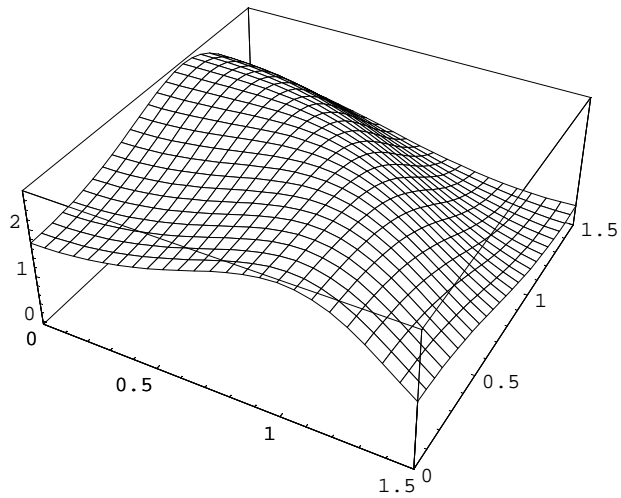
Remove["Global`*"]

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];
```

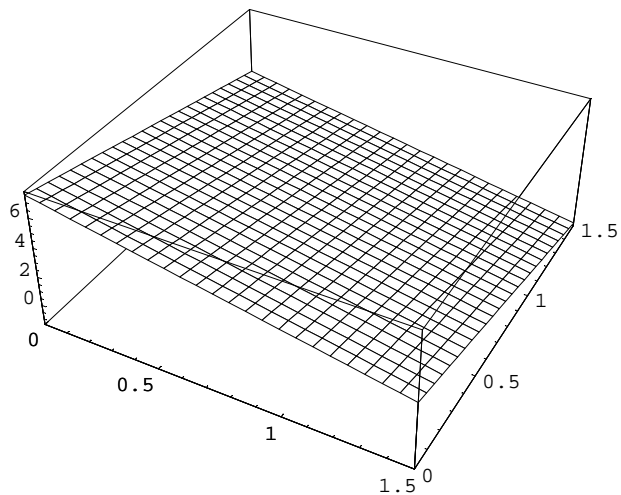


```
m = grad[f[x,y],x,y]/.{x->1,y->1} //N
```

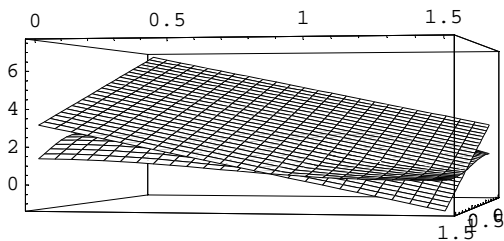
```
{-2.88881, -2.88881}
```

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

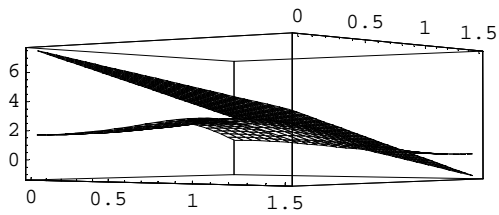
```
p5=Plot3D[TangEbene11[x,y],{x, 0,1.5}, {y, 0,1.5},
Shading->False];
```



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

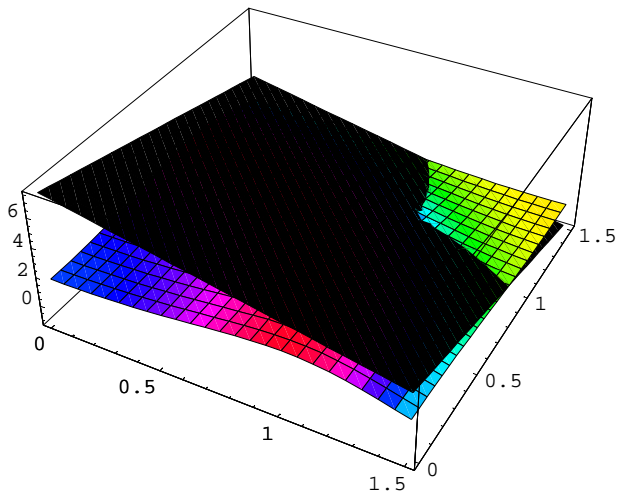


```
Show[p2,p5, ViewPoint->{2.866, -3.686, -0.086}];
```



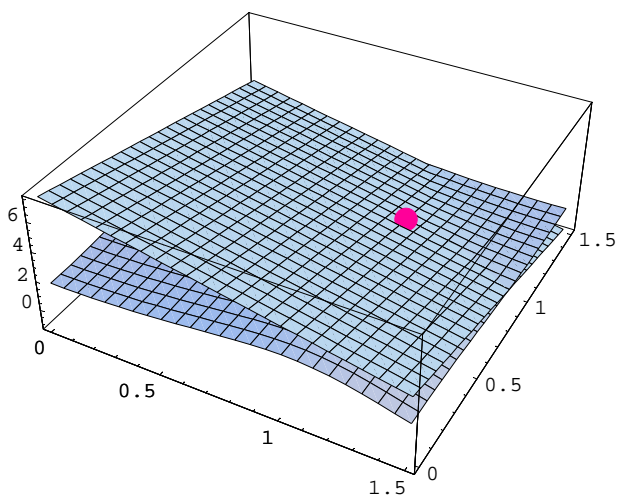
```
p5=Plot3D[TangEbenell[x,y],{x, 0,1.5}, {y, 0,1.5}, DisplayFunction->Identity];
p2=Plot3D[f[x,y],{x, 0,1.5}, {y, 0,1.5}, DisplayFunction->Identity,Lighting->
False,ColorFunction->Hue];
```

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



```
p5=Plot3D[TangEbenell[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]
```

```
Abs[Dg] Abs[- $\frac{f}{f-g} - \frac{fg}{(f-g)^2}$ ] + Abs[Df] Abs[ $\frac{fg}{(f-g)^2} - \frac{g}{f-g}$ ]
```

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

```
0.532937
```