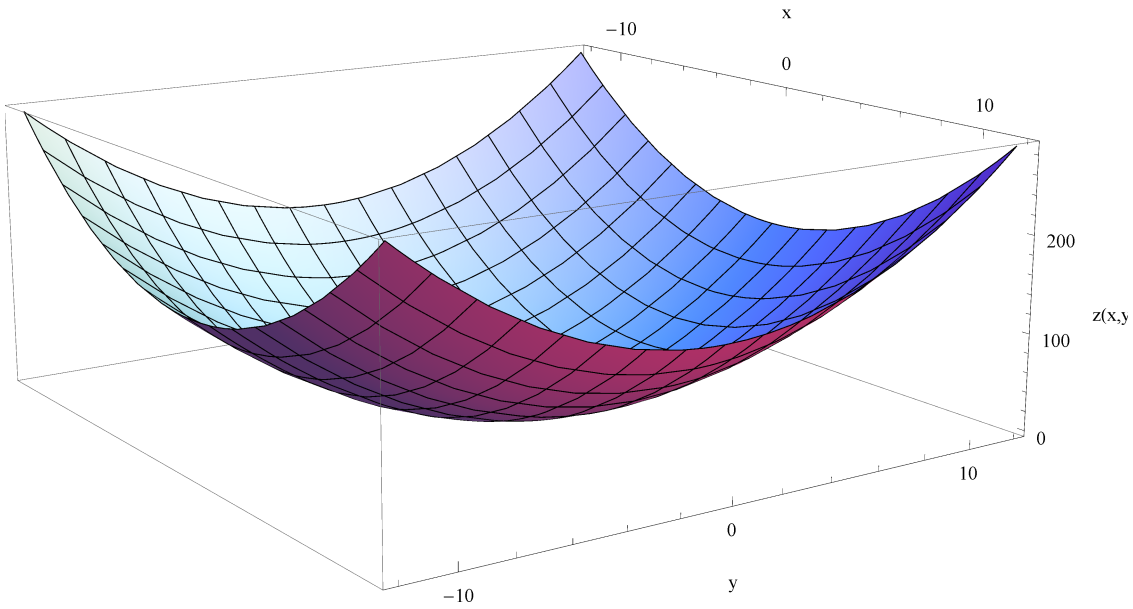
3. Gradijent u Kartezijevom koordinatnom sustavu

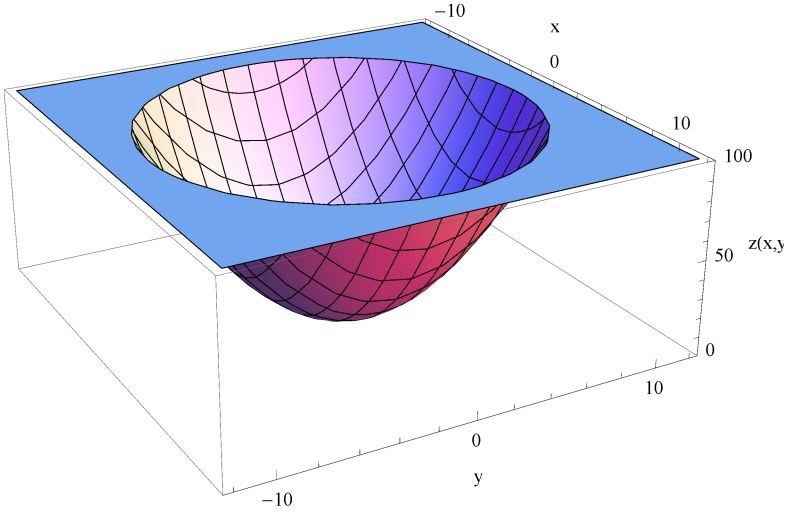
Grafički prikaz skalarnog polja z(x,y)=x^2+y^2

```
z[x_, y_] = x * x + y * y;
xmin = -12; xmax = 12; ymin = -12; ymax = 12;
Plot3D[z[x, y], {x, xmin, xmax}, {y, ymin, ymax}, AxesLabel -> {"x", "y", "z(x,y)"}]
```



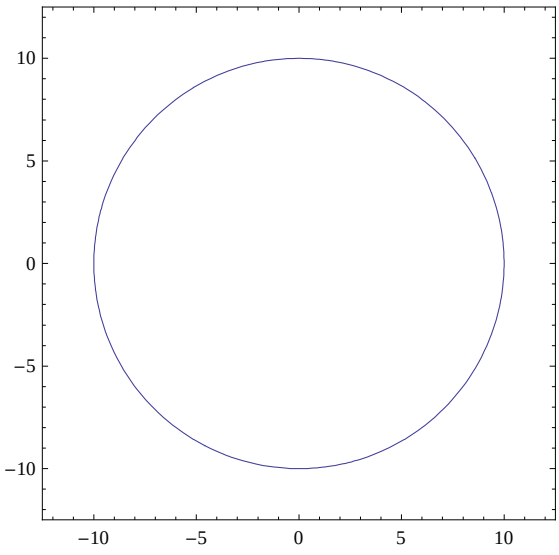
Nivo plohe prethodno definiranog polja su krivulje z(x,y)=r
Nivo plohu npr. z(x,y)=100 dobit ćemo kao presjek grafa funkcije z(x,y) i ravnine z=100

```
Plot3D[z[x, y], {x, xmin, xmax}, {y, ymin, ymax},
 PlotRange → {0, 100}, AxesLabel -> {"x", "y", "z(x,y)"}]
```



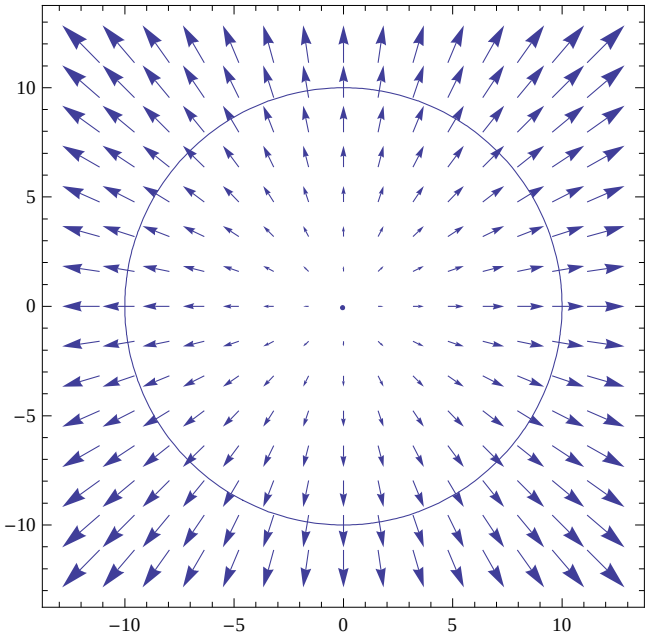
Dobivena nivo ploha z(x,y)=100 (kružnica)

```
ContourPlot[z[x, y] == 100, {x, xmin, xmax}, {y, ymin, ymax}, AxesLabel -> {"x", "y"}]
```



Prikaz gradijenta skalarnog polja z(x,y)=x^2+y^2 i njegove nivo-plohe z(x,y)=100
∇z(x,y)=2*xi+2*yj okomit je na krivulju z(x,y)=100

```
Show[VectorPlot[{2 * x, 2 * y}, {x, xmin, xmax}, {y, ymin, ymax}],
 ContourPlot[z[x, y] == 100, {x, xmin, xmax}, {y, ymin, ymax}]]
```



Gradijent skalarnog polja f(x,y,z)=x^2+y^2+z^2 i nivo-ploha f(x,y,z)=100 (kugla)
▽f(x,y,z)=2*xi+2*yj+2*zk okomit je nivo-plohu f(x,y,z)=100

```
f[x_, y_, z_] := x^2 + y^2 + z^2;
Show[ContourPlot3D[f[x, y, z] == 100, {x, xmin, xmax}, {y, ymin, ymax}, {z, -12, 12}],
 VectorPlot3D[{2 * x, 2 * y, 2 * z}, {x, -10, 10}, {y, -10, 10},
  {z, -10, 10}, AxesLabel → {"X", "Y", "Z"}, PlotRange → All,
  VectorPoints → 8, VectorStyle → "Arrow3D", VectorColorFunction → Hue]]
```