

2 Darstellung von Kurven und Flächen

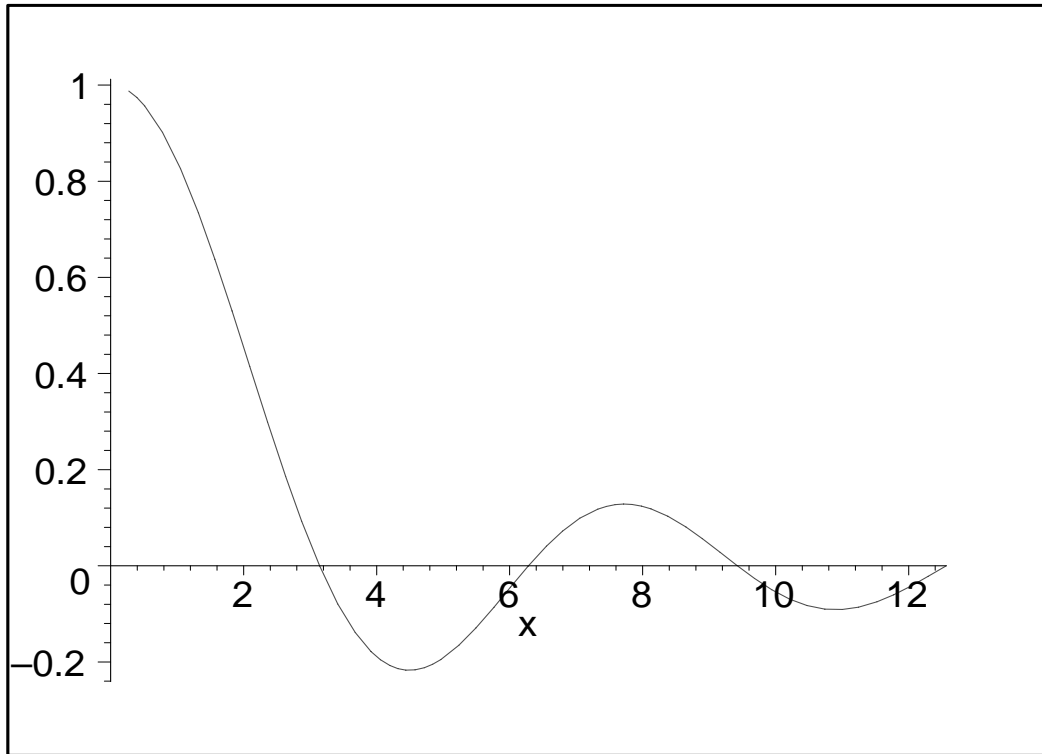
2.1 Kurvendarstellung

explizite Darstellung $y=f(x)$

```
> f:=1/x*sin(x);
```

$$f := \frac{\sin(x)}{x}$$

```
> plot(f,x=0..4*Pi);
```

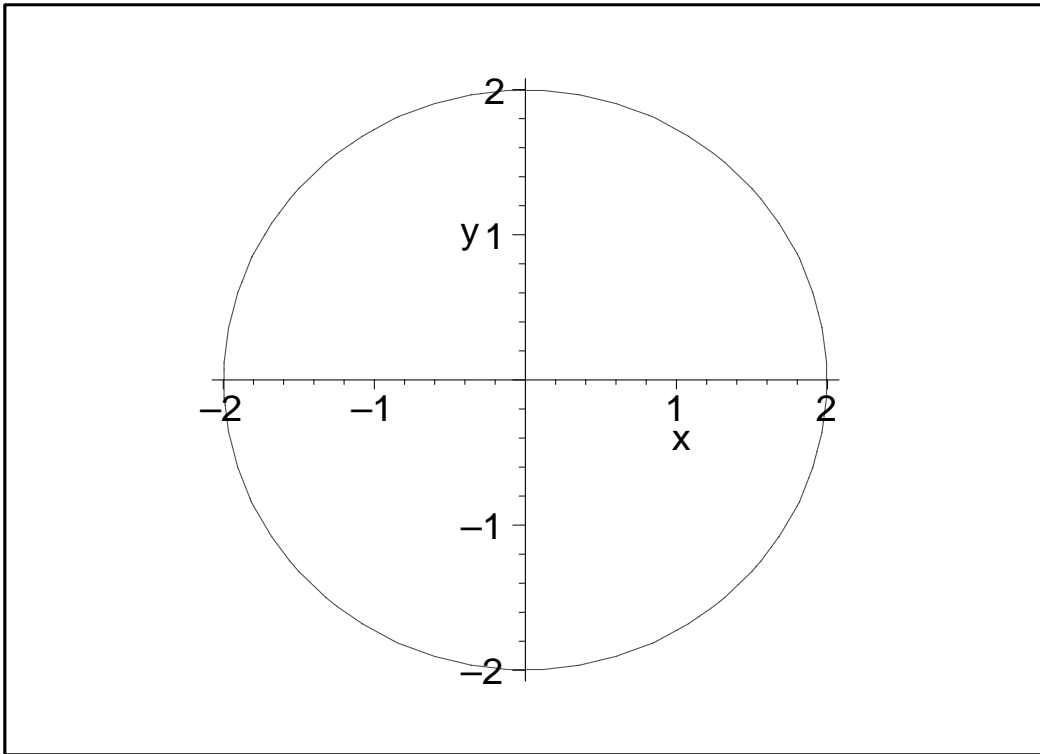


Implizite Darstellung $f(x,y)=0$

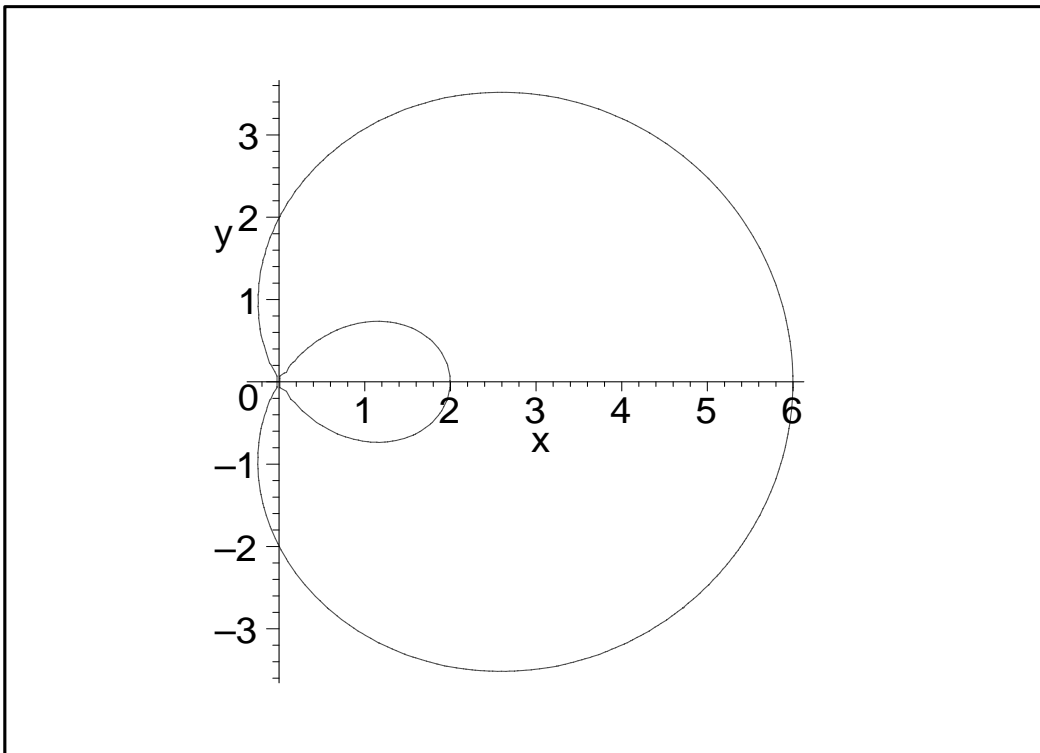
Beispiel 1: Kreis $x^2 + y^2 = r^2$, $(x - m)^2 + (y - n)^2 = r^2$

```
> with(plots):
```

```
> implicitplot(x^2+y^2-4,x=-3..3,y=-3..3,scaling=constrained);
```



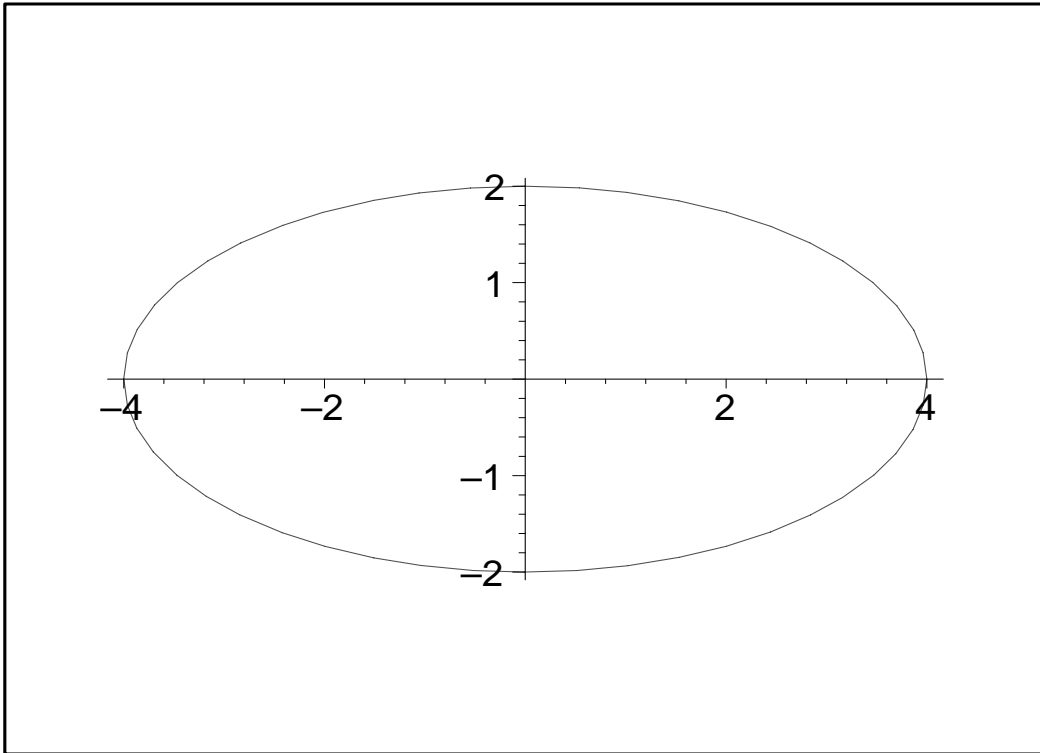
Beispiel 2: Pascalschnecke $(x^2 + y^2 - bx)^2 - a^2(x^2 + y^2) = 0$
 > `implicitplot((x^2+y^2-4*x)^2-4*(x^2+y^2),x=-1..6,y=-5..5,`
 > `numpoints=5000,scaling=constrained);`



Parameterdarstellung $x=f(t), y=g(t), z=h(t); t = [t_0..t_1]$

Ellipse:

```
> plot([4*cos(t),2*sin(t),t=0..2*Pi],scaling=constrained);
```



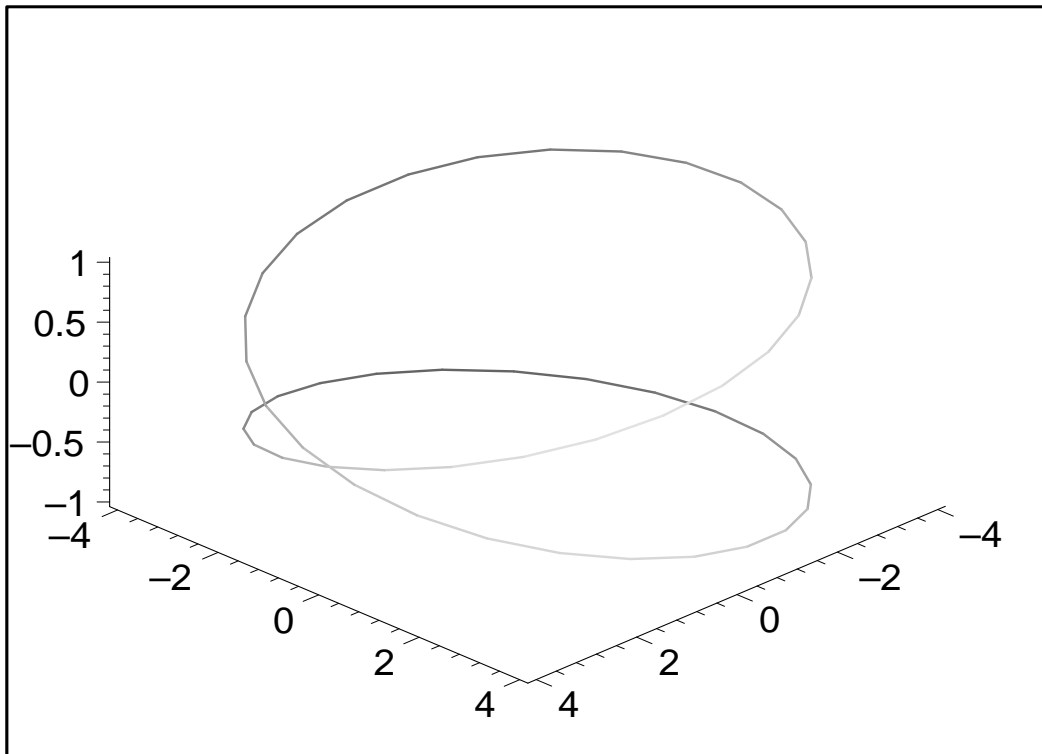
Raumkurve

$$x = 4 \cos t$$

$$y = 4 \sin t$$

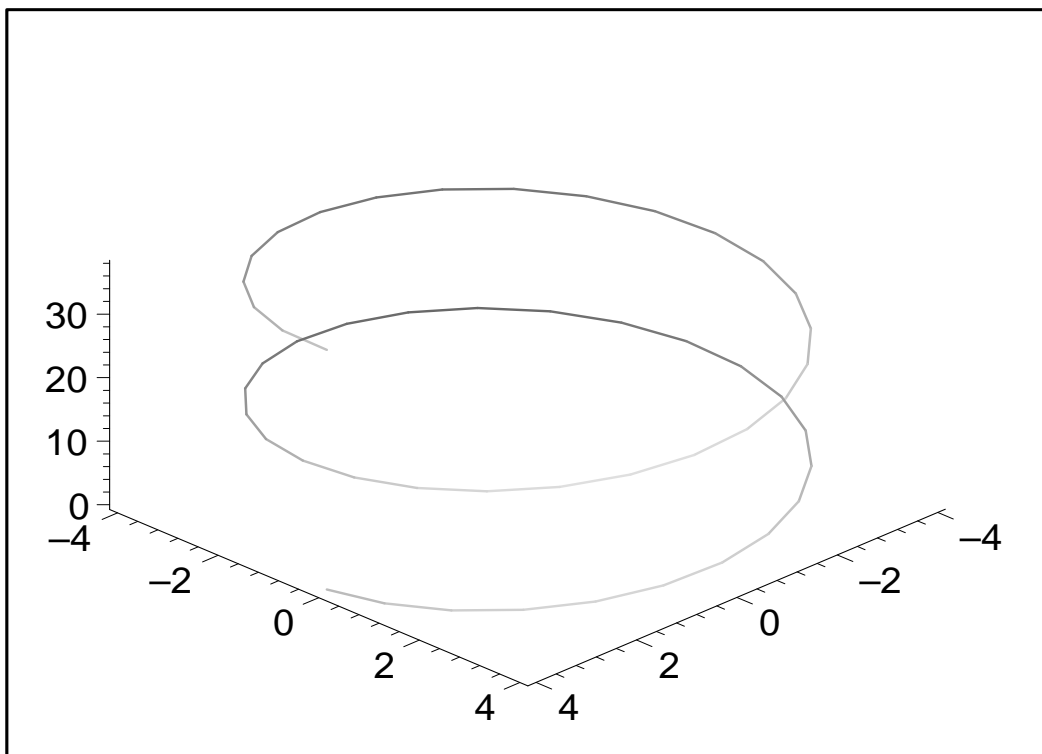
$$z = \sin \frac{t}{2}$$

```
> spacecurve([4*cos(t),4*sin(t),sin(t/2)],t=0..4*Pi,thickness=3,  
> axes=frame);
```



Schraublinie

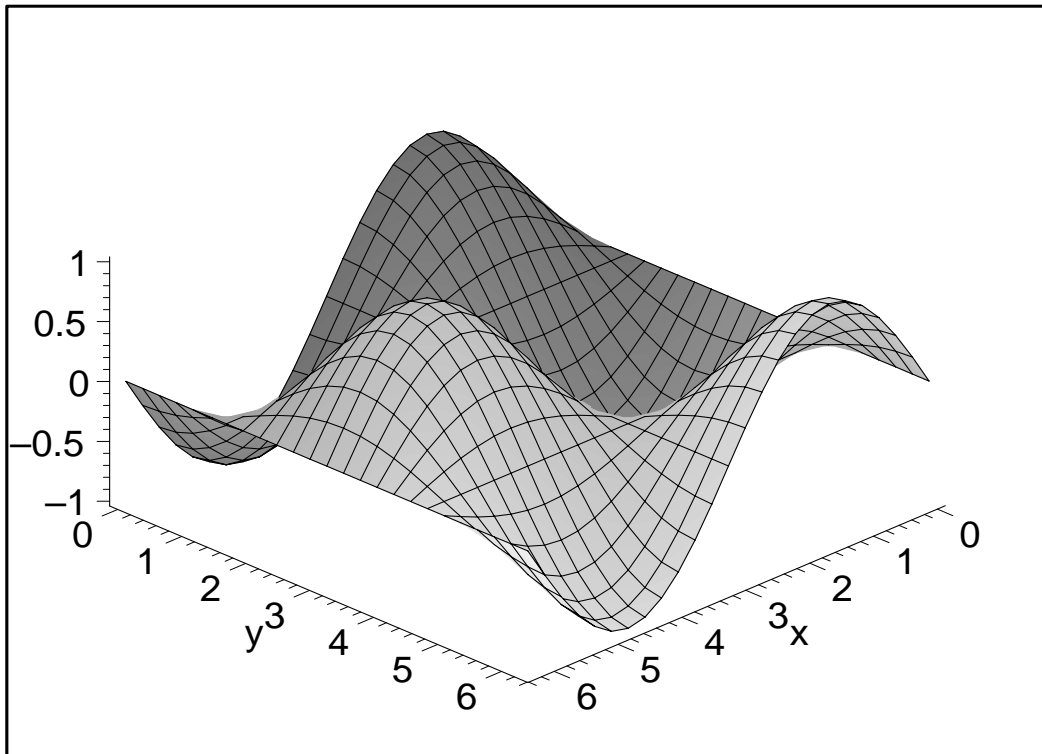
```
> spacecurve([4*cos(t),4*sin(t),3*(t)],t=0..4*Pi,thickness=3,
> axes=frame);
```



2.2 Flächendarstellung

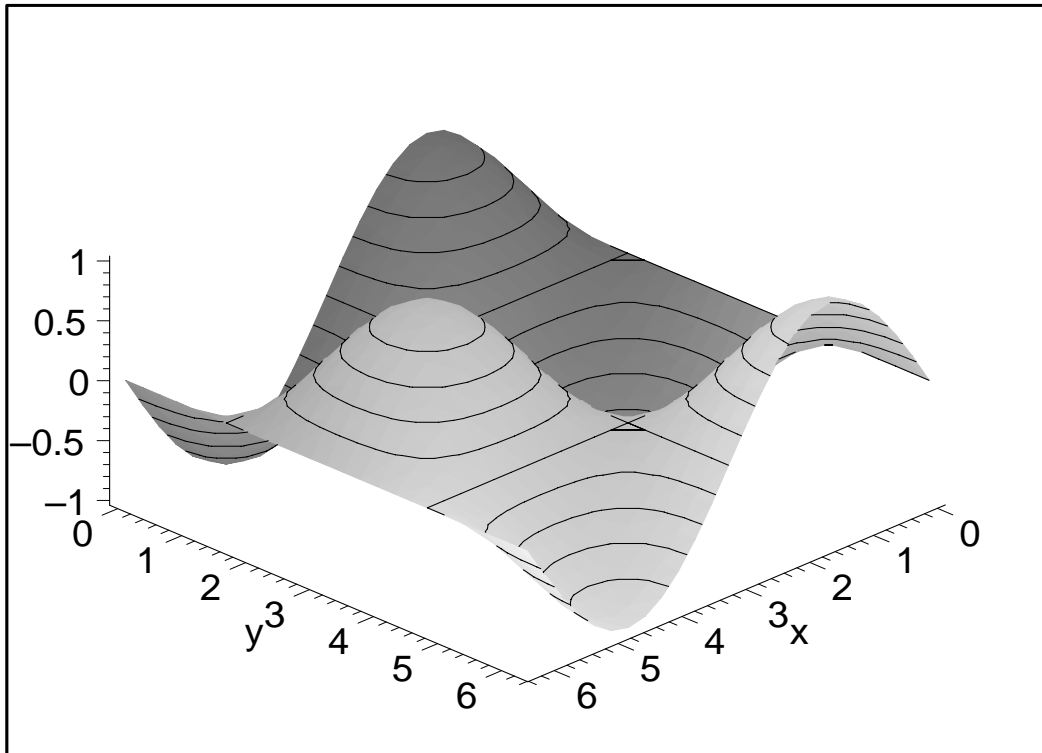
explizite Darstellung $z=f(x,y)$

```
> plot3d(sin(x)*cos(y),x=0..2*Pi,y=0..2*Pi,axes=frame);
```



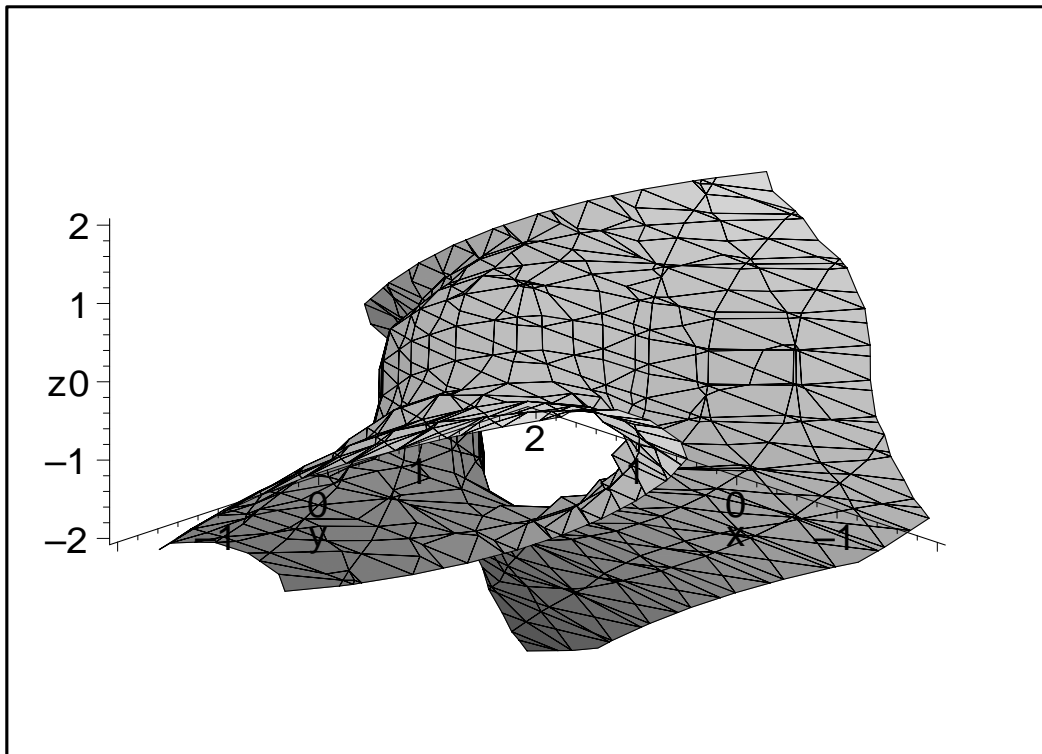
oder dieselbe Fläche als Konturplot (Höhenschichtenlinien)

```
> plot3d(sin(x)*cos(y),x=0..2*Pi,y=0..2*Pi,axes=frame,
> style=patchcontour);
```



implizite Darstellung $F(x,y,z)=0$

```
> implicitplot3d(x^3+y^2+z^3*sin(x)-1,x=-2..2,y=-2..2,z=-2..2,
> axes=frame,orientation=[45,121]);
```



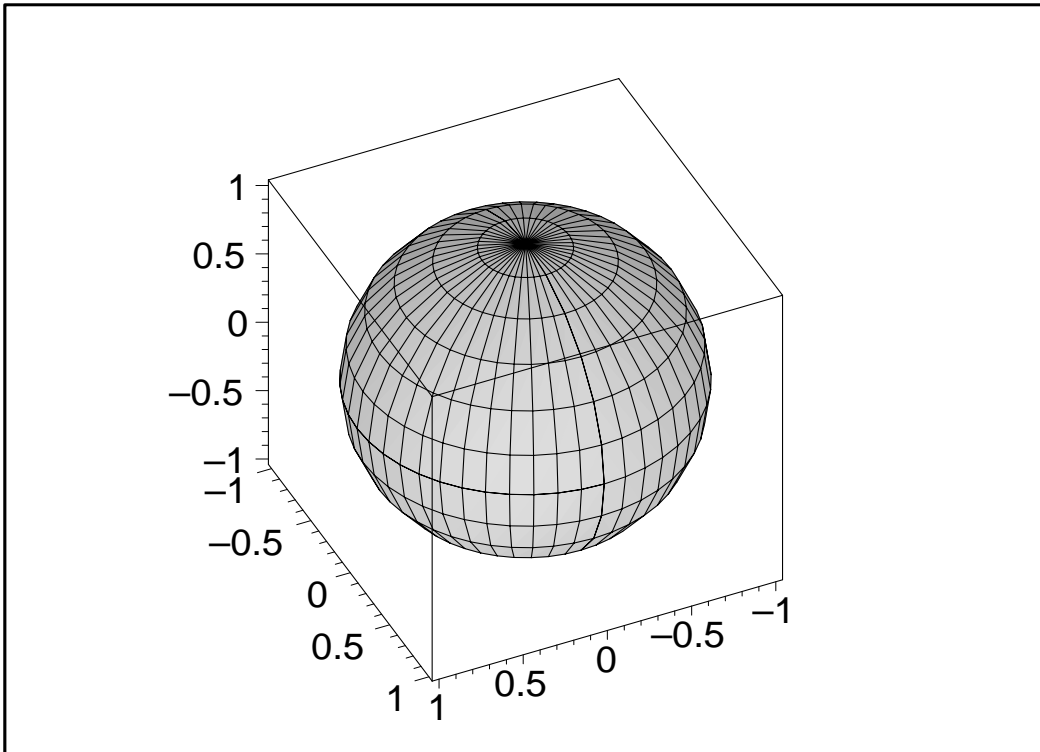
Parameterdarstellung $x = f(u, v), y = g(u, v), z = h(u, v)$
 $u \in [u_0..u_1] \subset \mathbb{R}, v \in [v_0..v_1] \subset \mathbb{R}$,
 z.B. Kugel:

$$\begin{aligned} x &= 4 \cos v \sin u \\ y &= 4 \cos v \cos u \\ z &= \sin v \end{aligned}$$

Plückerkonoid:

$$\begin{aligned} x &= 4 \cos u \sin v \\ y &= 4 \cos v \cos u \\ z &= \sin v \end{aligned}$$

```
> plot3d([cos(v)*sin(u),cos(v)*cos(u),sin(v)],u=0..Pi,v=0..2*Pi,
> scaling=constrained, axes=boxed,orientation=[65,50]);
```



Plückerkonoid

```
> plot3d([cos(u)*sin(v),cos(v)*cos(u),sin(v)],u=0..Pi,v=0..2*Pi,
> axes=frame,orientation=[50,60]);
```

