Rovnice kvadriky - maticový zápis

```
> restart;
> with(LinearAlgebra):
> X:=Vector[row]([x,y,z,1]);
```

$$X := [x, y, z, 1]$$

```
> K:=Matrix(a,1..4,1..4,shape=symmetric);
```

$$K := \begin{bmatrix} a(1,1) & a(1,2) & a(1,3) & a(1,4) \\ a(1,2) & a(2,2) & a(2,3) & a(2,4) \\ a(1,3) & a(2,3) & a(3,3) & a(3,4) \\ a(1,4) & a(2,4) & a(3,4) & a(4,4) \end{bmatrix}$$

```
> RovKv:=X.K.Transpose(X)=0;
```

$$RovKv := x\,(x\,a(1,1) + y\,a(1,2) + z\,a(1,3) + a(1,4)) + y\,(x\,a(1,2) + y\,a(2,2) + z\,a(2,3) + a(2,4)) + z\,(x\,a(1,3) + y\,a(2,3) + z\,a(3,3) + a(3,4)) + x\,a(1,4) + y\,a(2,4) + z\,a(3,4) + a(4,4) = 0$$

```
> RovKv:=expand(RovKv);
```

$$RovKv := x^2\,a(1,1) + 2\,x\,y\,a(1,2) + 2\,x\,z\,a(1,3) + 2\,x\,a(1,4) + y^2\,a(2,2) + 2\,y\,z\,a(2,3) + 2\,y\,a(2,4) + z^2\,a(3,3) + 2\,z\,a(3,4) + a(4,4) = 0$$

```
> RovKv:=sort(RovKv,[x,y,z],tdeg);
```

$$RovKv := a(1,1)\,x^2 + 2\,a(1,2)\,x\,y + 2\,a(1,3)\,x\,z + a(2,2)\,y^2 + 2\,a(2,3)\,y\,z + a(3,3)\,z^2 + 2\,a(1,4)\,x + 2\,a(2,4)\,y + 2\,a(3,4)\,z + a(4,4) = 0$$

Zobrazení kvadriky

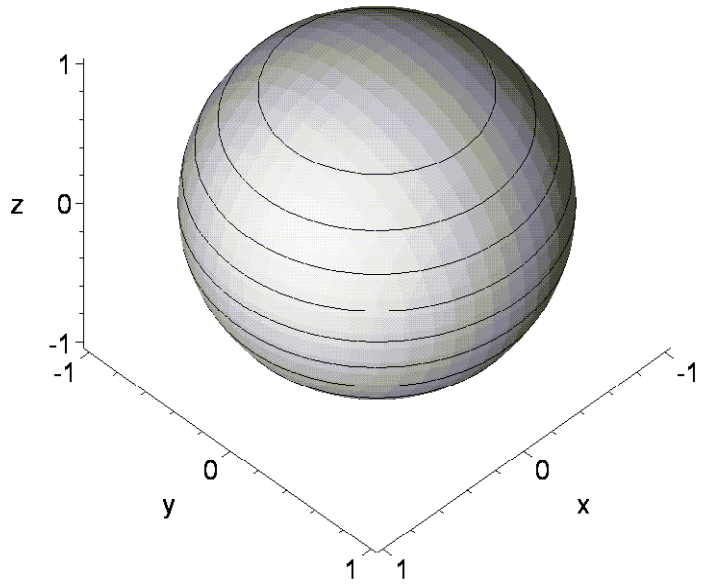
Kv1: Kulová plocha

```
> restart;
> Kv1:=x^2+y^2+z^2-1=0;
```

$$Kv1 := x^2 + y^2 + z^2 - 1 = 0$$

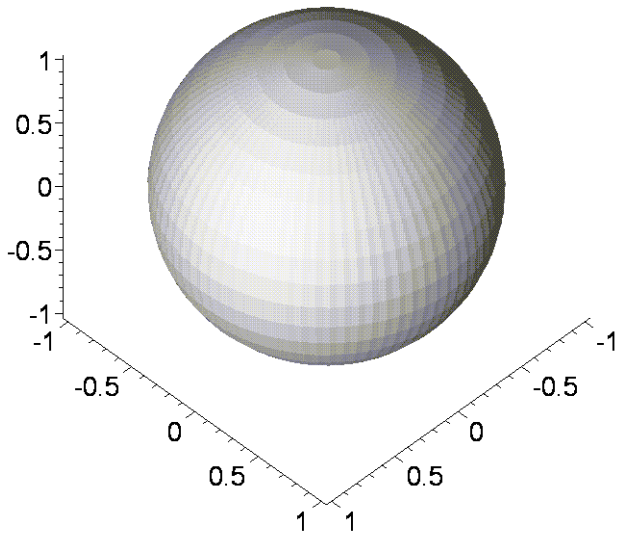
Zobrazení plochy dané rovnicí užitím **plots[implicitplot]**

```
> plots[implicitplot3d](Kv1,x=-1..1,y=-1..1,z=-1..1,axes=frame,col
  or=COLOR(RGB,204/255,204/255,204/255),style=patchcontour,grid=[2
  0,20,20],light=[100,-20,1,1,1],tickmarks=[3,3,3]);
```



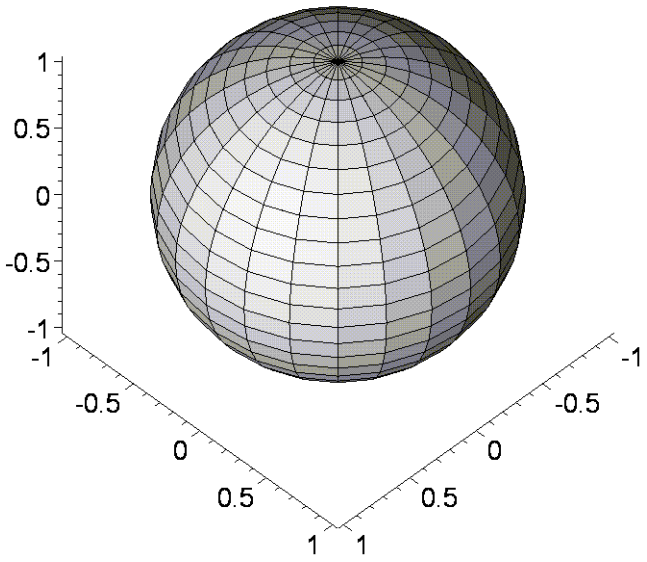
Zobrazení parametrického vyjádření plochy užitím **plot3d**

```
> Sph:=plot3d([sin(u)*cos(t),sin(u)*sin(t),cos(u)],t=-Pi..Pi,u=-Pi
  ..Pi,grid=[40,40],style=patchnogrid):
> plots[display](Sph,scaling=constrained,color=COLOR(RGB,204/255,2
  04/255,204/255),light=[100,-20,1,1,1],axes=frame);
```



Zobrazení kulové plochy užitím příkazu **sphere** z balíčku **plottools**

```
> Sph2:=plottools[sphere]([0,0,0],1):
> plots[display](Sph2,scaling=constrained,color=COLOR(RGB,204/255,
  204/255,204/255),light=[100,-20,1,1,1],axes=frame);
```



Kv2: Dvě roviny

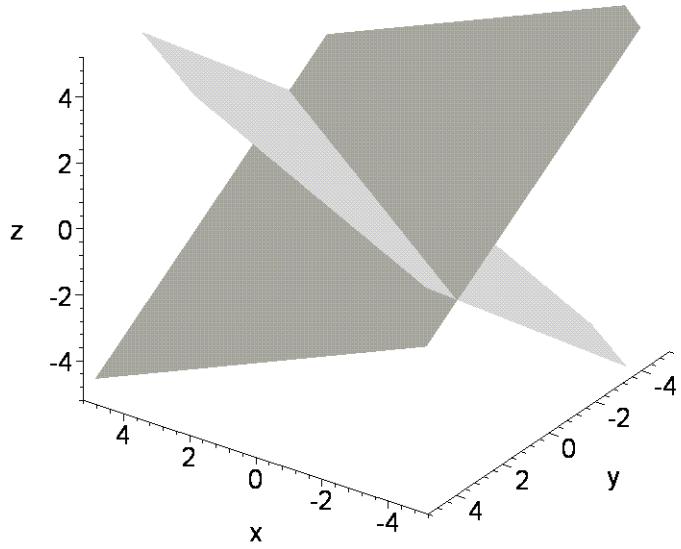
```
> restart;
> Kv2:=(2*x+3*y-4*z+1)*(3*x+4*y+7*z-3)=0;
```

$$Kv2 := (2x + 3y - 4z + 1)(3x + 4y + 7z - 3) = 0$$

```
> op(lhs(Kv2));
```

$$2x + 3y - 4z + 1,\ 3x + 4y + 7z - 3$$

```
> plots[implicitplot3d]([op(lhs(Kv2))],x=-5..5,y=-5..5,z=-5..5,ori
  entation=[125,60],gridstyle=rectangular,axes=frame,grid=[10,10,1
  0],style=patchnogrid,color=[COLOR(RGB,204/255,204/255,204/255),C
  OLOR(RGB,153/255,153/255,153/255)]);
```

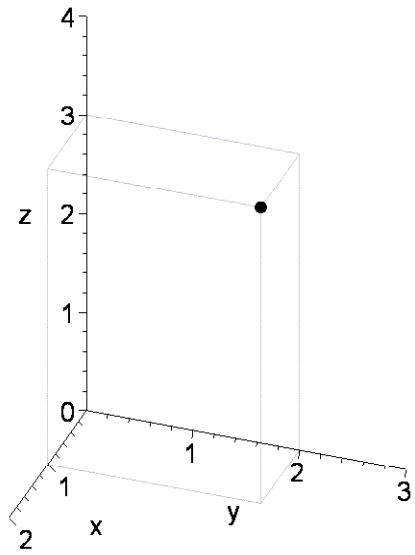


Kv3: Bod

```
> restart;
> Kv3:=(x-1)^2+(y-2)^2+(z-3)^2=0;
```

$$Kv3 := (x-1)^2 + (y-2)^2 + (z-3)^2 = 0$$

```
> Bod:=plottools[sphere]([1,2,3],0.05,color=black):
> Kvadr:=plottools[cuboid]([0,0,0],[1,2,3],style=wireframe,color=g
  rey):
> plots[display](Bod,
  Kvadr,axes=normal,orientation=[20,60],tickmarks=[2,3,4],scaling=
  constrained,view=[0..2,0..3,0..4],labels=[x,y,z]);
```



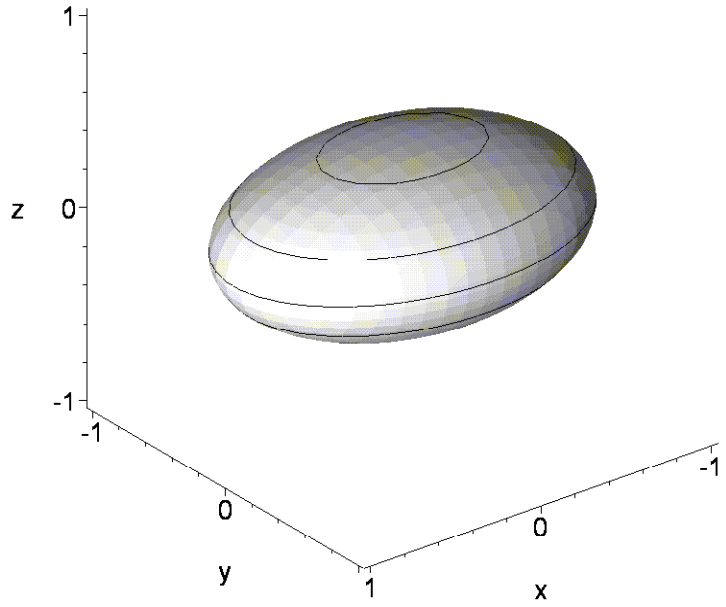
Kv5: Elipsoid

```
> restart;
```

```
> Kv5:=x^2+2*y^2+5*z^2-1=0;
```

$$Kv5 := x^2 + 2\,y^2 + 5\,z^2 - 1 = 0$$

```
> plots[implicitplot3d](Kv5,x=-1..1,y=-1..1,z=-1..1,axes=frame,col
  or=COLOR(RGB,250/255,250/255,250/255),style=patchcontour,grid=[2
  0,20,40],light=[100,-20,1,1,1],tickmarks=[3,3,3],orientation=[52
  ,63],scaling=constrained);
```



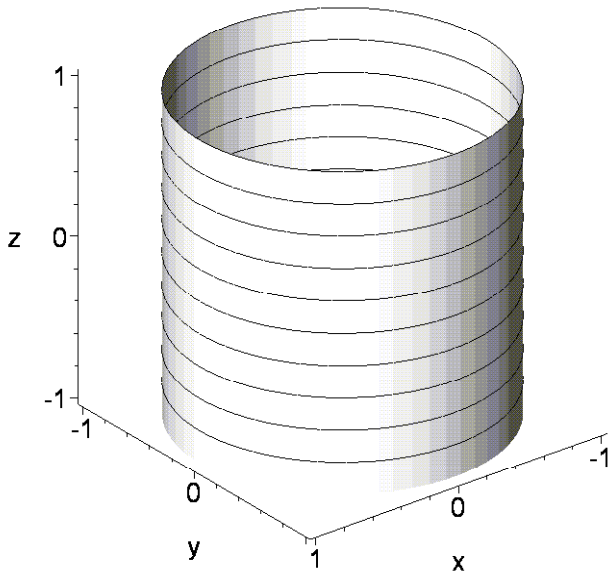
Kv6: Válcová plocha

```
> restart;
```

```
> Kv6:=x^2+y^2-1=0;
```

$$Kv6 := x^2 + y^2 - 1 = 0$$

```
> plots[implicitplot3d](Kv6,x=-1..1,y=-1..1,z=-1..1,axes=frame,col
  or=COLOR(RGB,250/255,250/255,250/255),style=patchcontour,grid=[2
  0,20,40],light=[100,-20,1,1,1],tickmarks=[3,3,3],orientation=[52
  ,63],scaling=constrained);
```



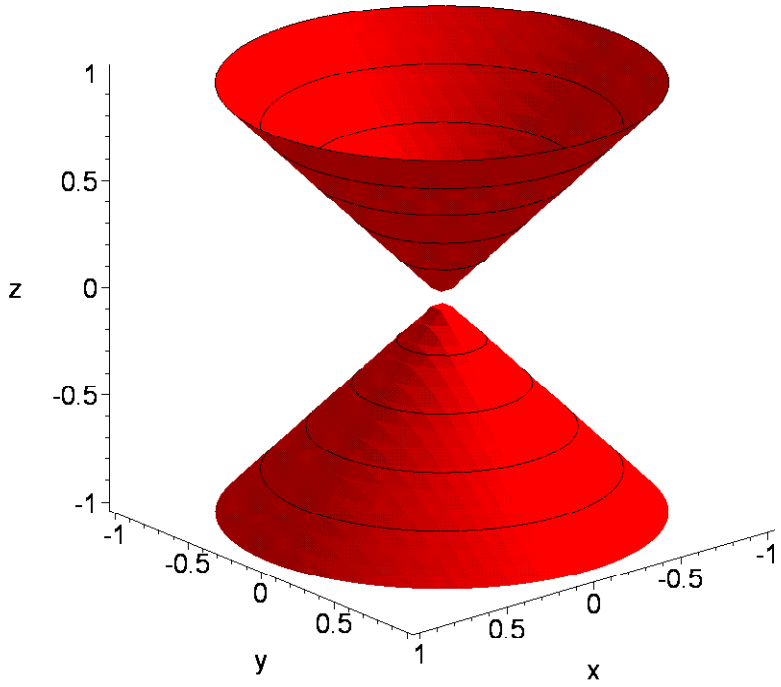
Kv7: Kuželová plocha

```
> restart;
> Kv7:=x^2+y^2-z^2=0;
```

$$Kv7 := x^2 + y^2 - z^2 = 0$$

Zobrazení kuželové plochy užitím příkazu **plots[implicitplot]**

```
> plots[implicitplot3d](Kv7,x=-1..1,y=-1..1,z=-1..1,grid=[30,30,30
  ],axes=frame,orientation=[50,70],style=patchcontour,color=red,li
  ghtmodel=light1,scaling=constrained);
```



Zobrazení parametrického vyjádření kuželové plochy užitím příkazu **plot3d**

```
> Kv7p:=subs(x=t*cos(u),y=t*sin(u),Kv7);
```

$$Kv7p := t^2 \cos(u)^2 + t^2 \sin(u)^2 - z^2 = 0$$

```
> Res_z:=solve(Kv7p,{z});
```

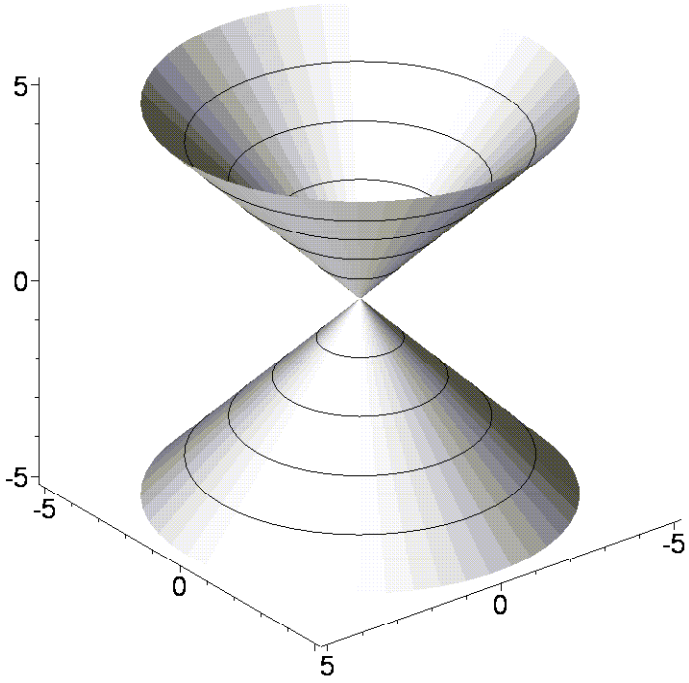
$$Res\_z := \{z = -t\}, \{z = t\}$$

```
> Kv7p[1]:=eval([t*cos(u),t*sin(u),z],Res_z[1]);
  Kv7p[2]:=eval([t*cos(u),t*sin(u),z],Res_z[2]);
```

$$Kv7p_1 := [t \cos(u), t \sin(u), -t]$$

$$Kv7p_2 := [t \cos(u), t \sin(u), t]$$

```
> plot3d({Kv7p[1],Kv7p[2]},t=0..5,u=0..2*Pi,orientation=[52,63],gr
  id=[50,50],style=patchcontour,axes=frame,color=COLOR(RGB,250/255
  ,250/255,250/255),light=[100,-20,1,1,1],tickmarks=[3,3,3],scalin
  g=constrained);
```

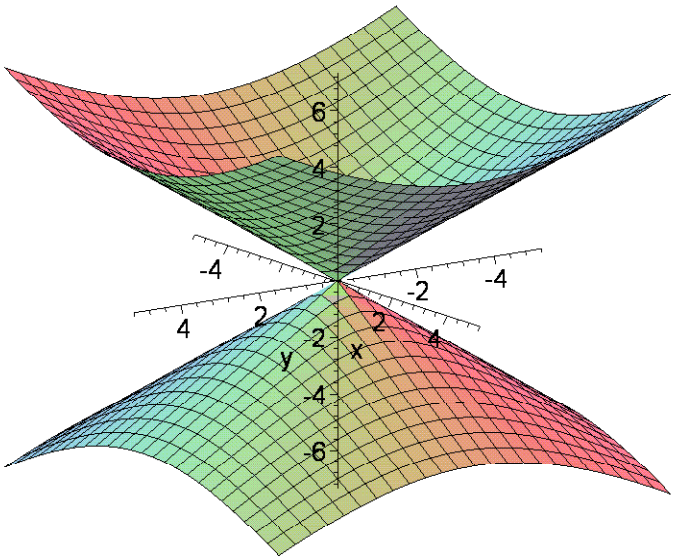


Zobrazení kuželové plochy jako dvou funkcí o dvou proměnných

```
> Kv7_2:=solve(Kv7,z);
```

$$Kv7\_2 := \sqrt{x^2+y^2}, -\sqrt{x^2+y^2}$$

```
> plot3d({Kv7_2},x=-5..5,y=-5..5,axes=normal,orientation=[55,75],c
  olor=grey,lightmodel=light1);
```


6
4
2
-4
-2
-4
4
2
2
4
y
-2
x
-4
-6

>