

## Vi starter på nytt

*restart :*

## Vi lader inn kommandopakken

*with(plots)*

[*animate, animate3d, animatecurve, arrow, changecoords, complexplot, complexplot3d, conformal, conformal3d, contourplot, contourplot3d, coordplot, coordplot3d, densityplot, display, dualaxisplot, fieldplot, fieldplot3d, gradplot, gradplot3d, implicitplot, implicitplot3d, inequal, interactive, interactiveparams, intersectplot, listcontplot, listcontplot3d, listdensityplot, listplot, listplot3d, loglogplot, logplot, matrixplot, multiple, odeplot, pareto, plotcompare, pointplot, pointplot3d, polarplot, polygonplot, polygonplot3d, polyhedra\_supported, polyhedraplot, rootlocus, semilogplot, setcolors, setoptions, setoptions3d, spacecurve, sparsematrixplot, surfdata, textplot, textplot3d, tubeplot*]

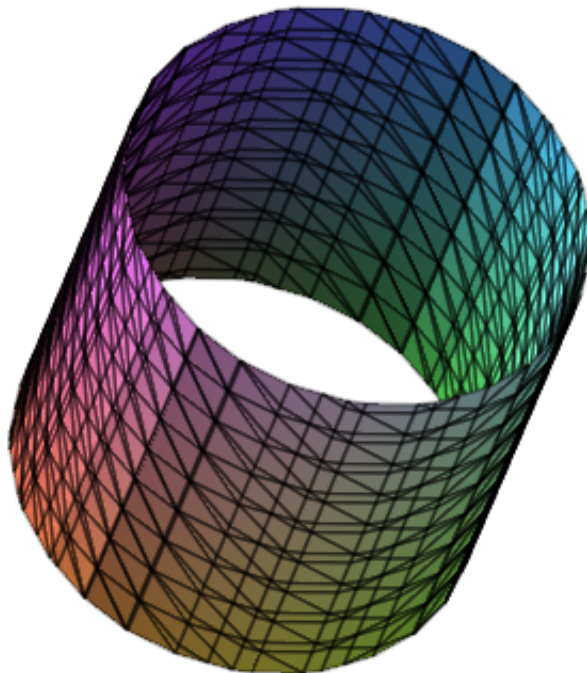
(1)

## Kvadratiske flater

**Tegne cylinderen  $x^2 + y^2 = 1$**

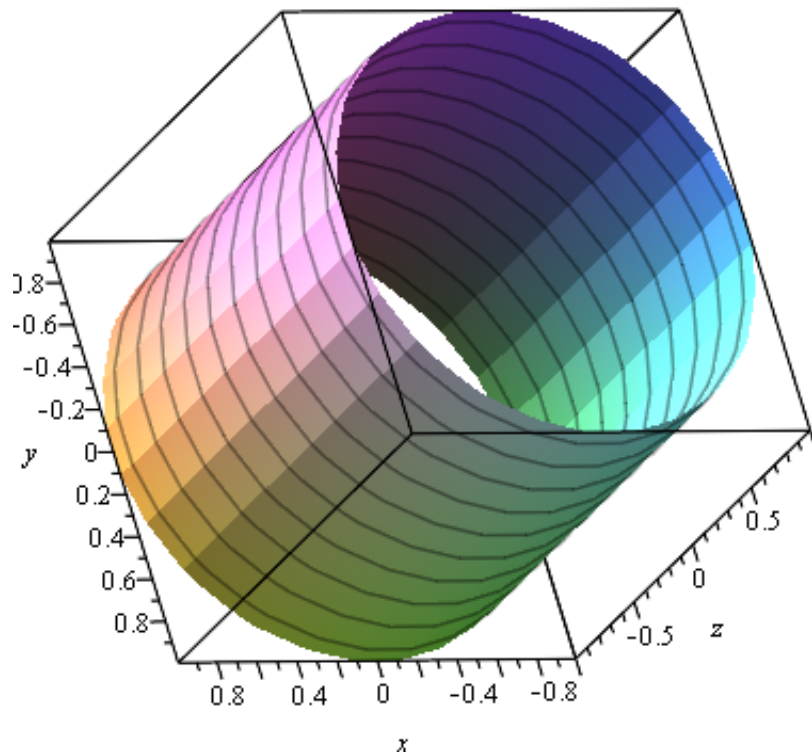
**- vi bruker `implicitplot3d`**

*implicitplot3d(x<sup>2</sup> + y<sup>2</sup> = 1, x = -1 ..1, y = -1 ..1, z = -1 ..1)*



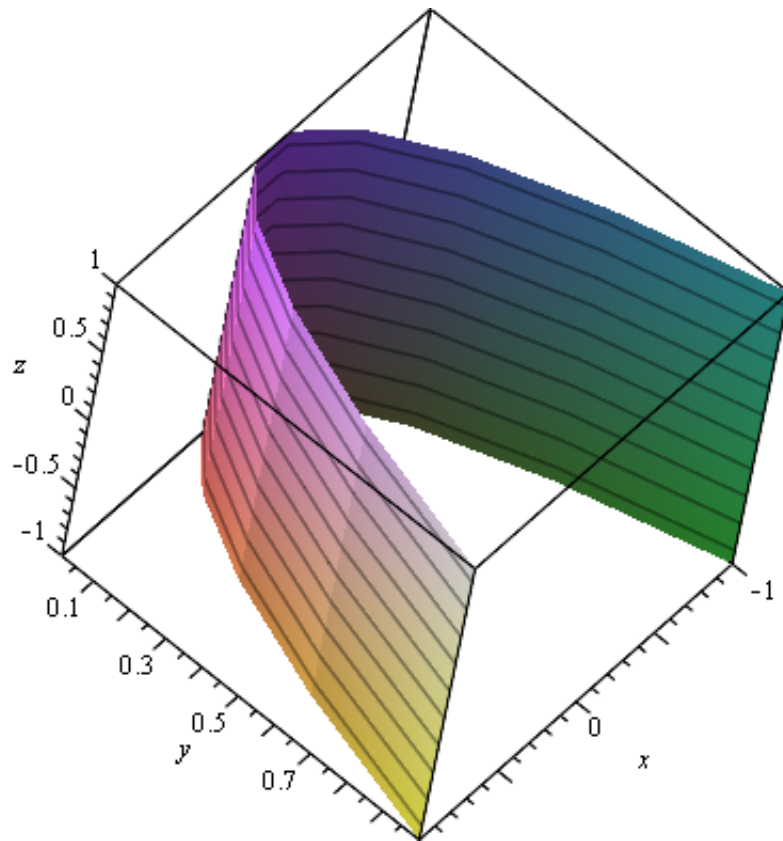
- vi kan si til Maple til å lage et bilde med aksene og nivåkurvene

`implicitplot3d(x2 + y2 = 1, x = -1 .. 1, y = -1 .. 1, z = -1 .. 1, axes = boxed, style = patchcontour)`



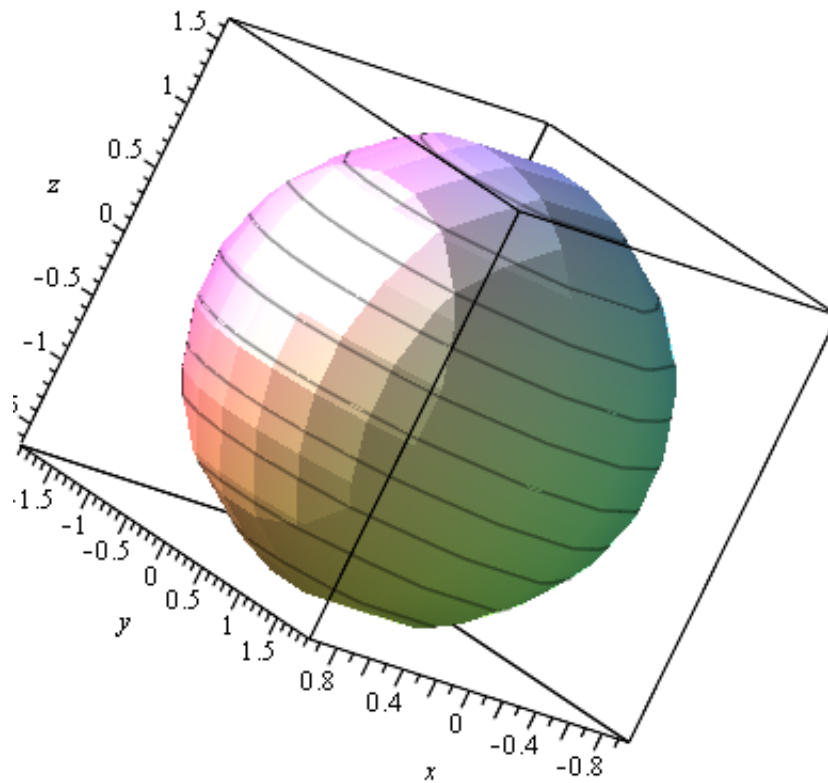
**Tegne cylinderen  $x^2 = y$**

`implicitplot3d(x2 = y, x = -1 .. 1, y = -1 .. 1, z = -1 .. 1, axes = boxed, style = patchcontour)`



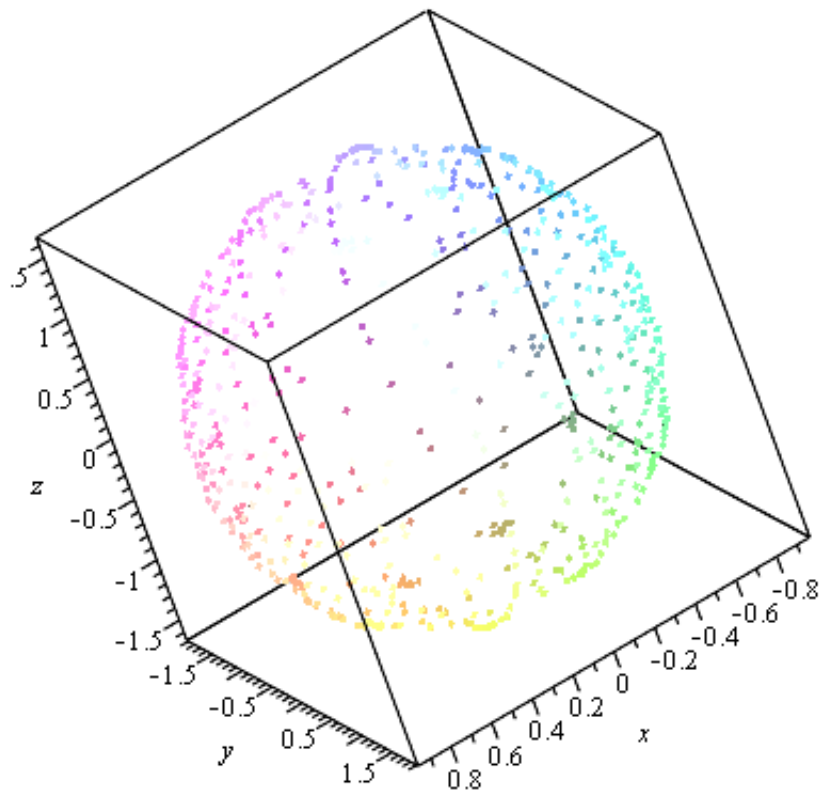
**Tegne ellipsoiden  $x^2 / 1 + y^2 / 4 + z^2 / 3 = 1$  (vi trenger større område nå, la x y og z gå fra -2 til 2)**

`implicitplot3d( $\frac{x^2}{1} + \frac{y^2}{4} + \frac{z^2}{3} = 1, x=-2..2, y=-2..2, z=-2..2, axes = boxed, style = patchcontour$ )`



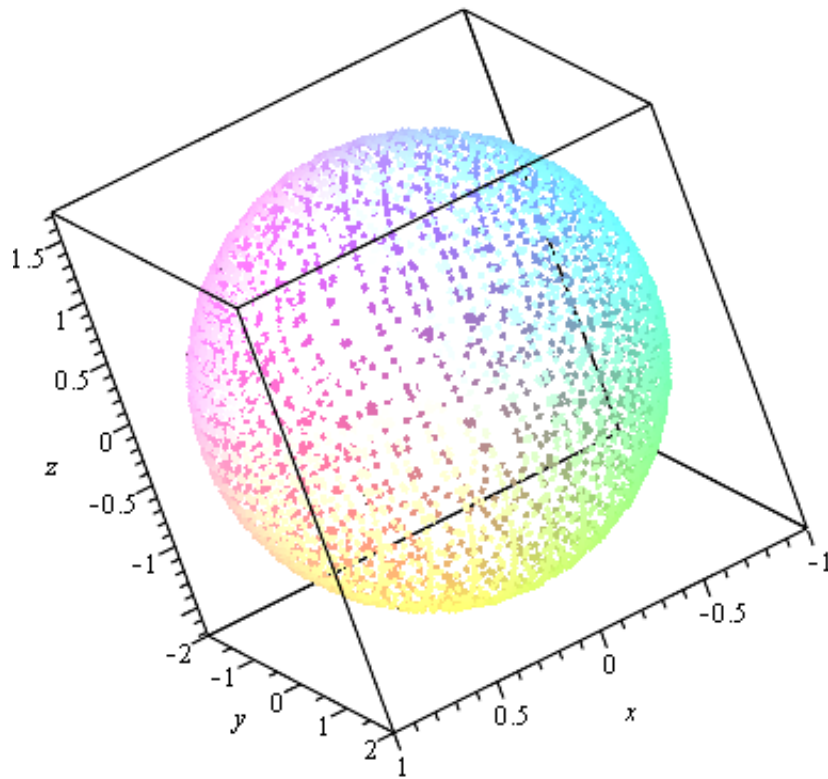
**Vi ser at flaten er ikke så glatt, det er på grunn av at Maple bruker få punkter til å finne ut hvordan flaten ser ut**

$$\text{implicitplot3d}\left(\frac{x^2}{1} + \frac{y^2}{4} + \frac{z^2}{3} = 1, x=-2..2, y=-2..2, z=-2..2, \text{axes} = \text{boxed}, \text{style} = \text{point}\right)$$



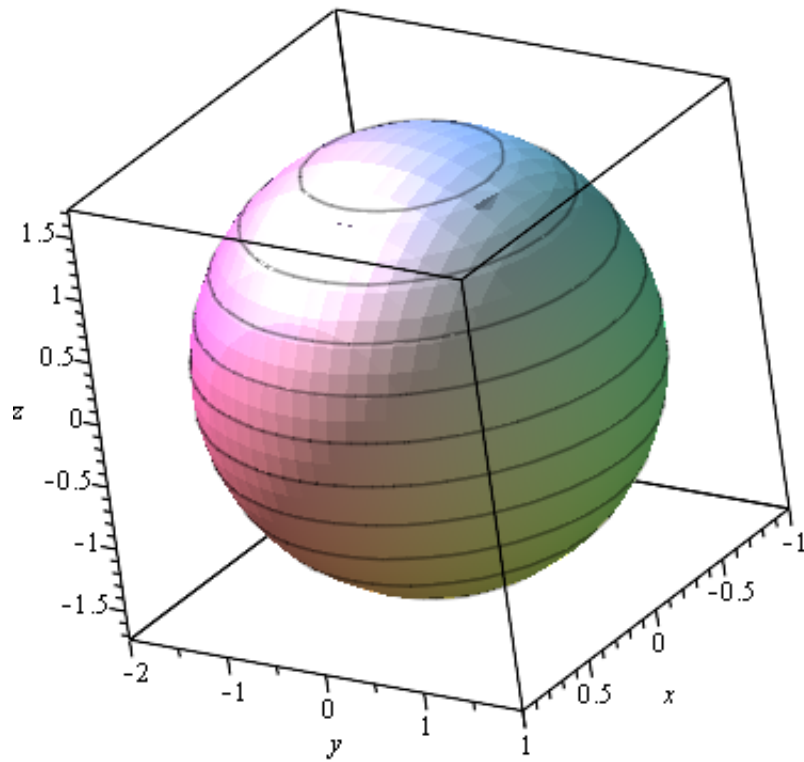
**Vi kan bruke flere punkter, for eksempel 25 x 25 x 25 (25 forskjellige x koordinater, 25 forskjellige y koordinater, 25 forskjellige z koordinater)**

```
implicitplot3d( $\frac{x^2}{1} + \frac{y^2}{4} + \frac{z^2}{3} = 1$ , x=-2..2, y=-2..2, z=-2..2, axes = boxed, style = point, grid
= [25, 25, 25])
```



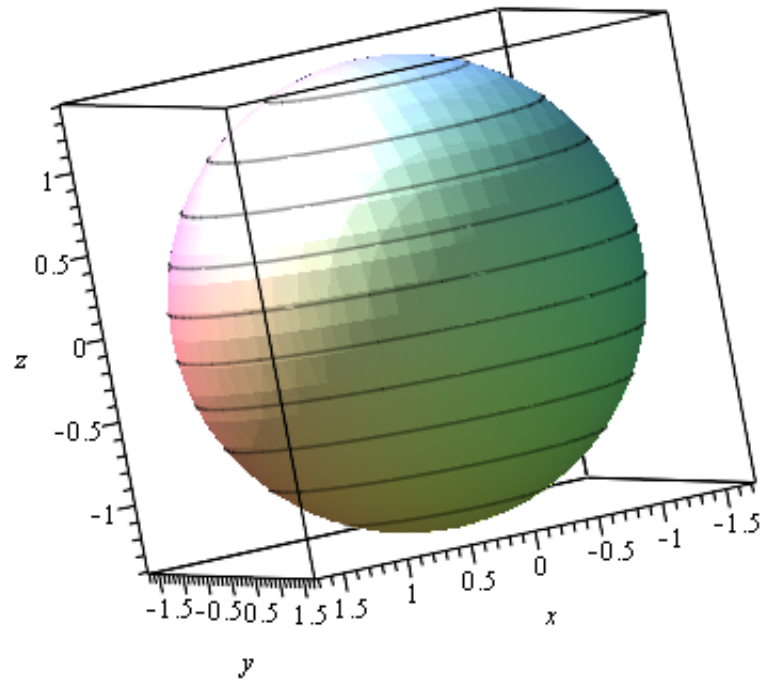
**Flaten blir også bedre**

```
implicitplot3d( $\frac{x^2}{1} + \frac{y^2}{4} + \frac{z^2}{3} = 1$ ,  $x=-2..2, y=-2..2, z=-2..2$ , axes = boxed, style = patchcontour,  
grid = [25, 25, 25])
```



**Flatklemt sfæroide (two av aksene er like lange, den tredje er det minste. Jorden, himmellegemer)**

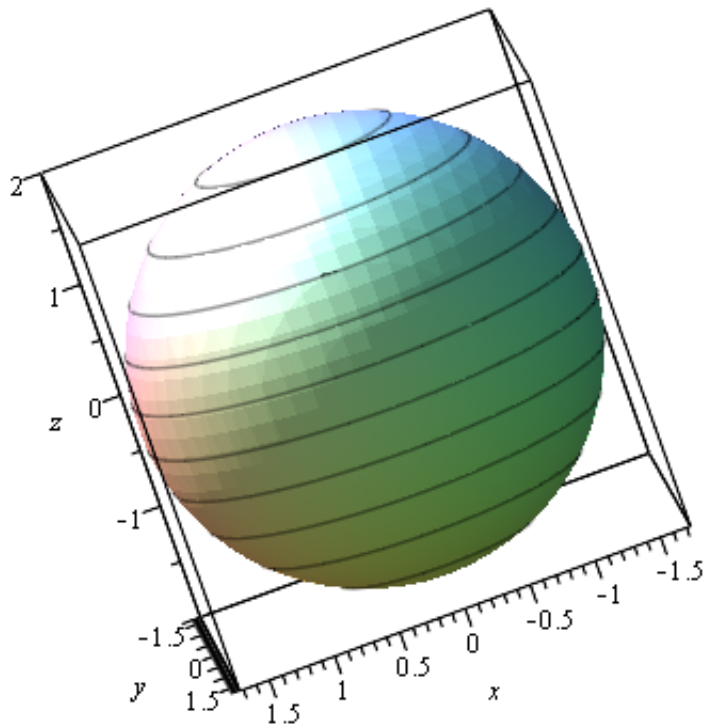
```
implicitplot3d( $\frac{x^2}{3} + \frac{y^2}{3} + \frac{z^2}{2} = 1$ , x=-2..2, y=-2..2, z=-2..2, axes = boxed, style = patchcontour,
  grid = [25, 25, 25])
```



**Forlenget sfæroide (two av aksene er like lange, den tredje er det største)**

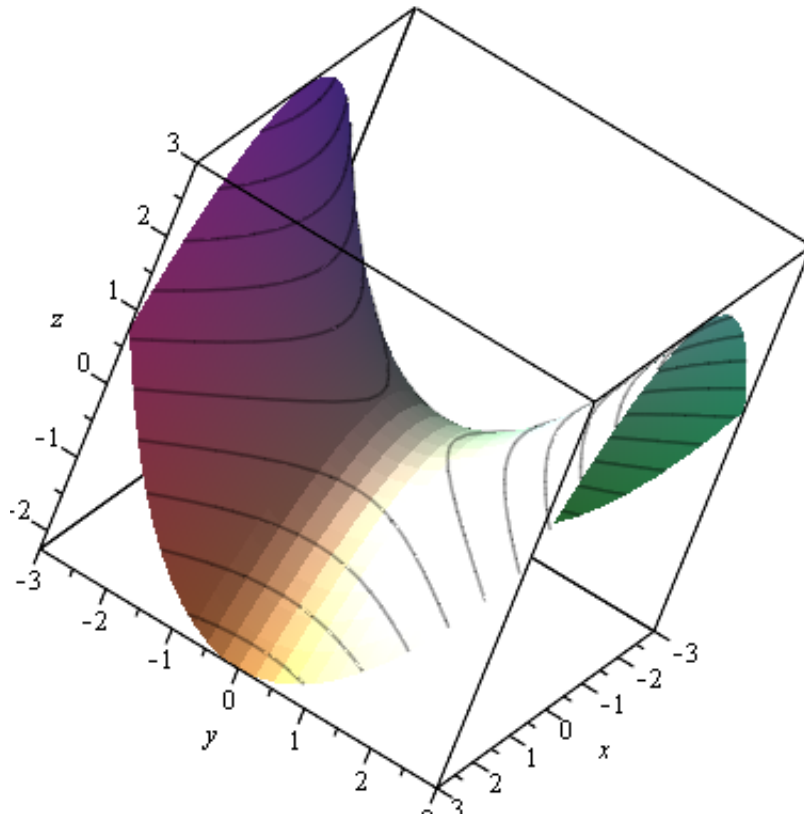
```
implicitplot3d( $\frac{x^2}{3} + \frac{y^2}{3} + \frac{z^2}{4} = 1$ ,  $x = -2..2, y = -2..2, z = -2..2$ , axes = boxed, style = patchcontour,  
grid = [25, 25, 25])
```





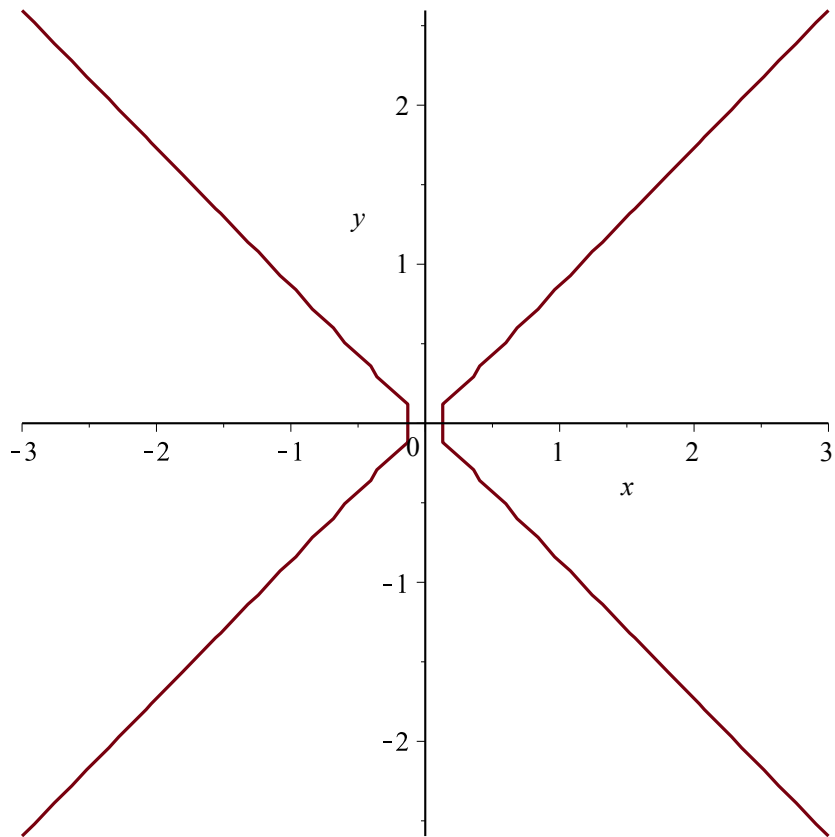
**Tegne flaten  $y^2/3 - x^4/4 = z$  (hyperbolsk paraboloid)**

```
implicitplot3d( $\frac{y^2}{3} - \frac{x^2}{4} = z$ , x=-3..3, y=-3..3, z=-3..3, axes = boxed, style = patchcontour, grid
= [25, 25, 25])
```



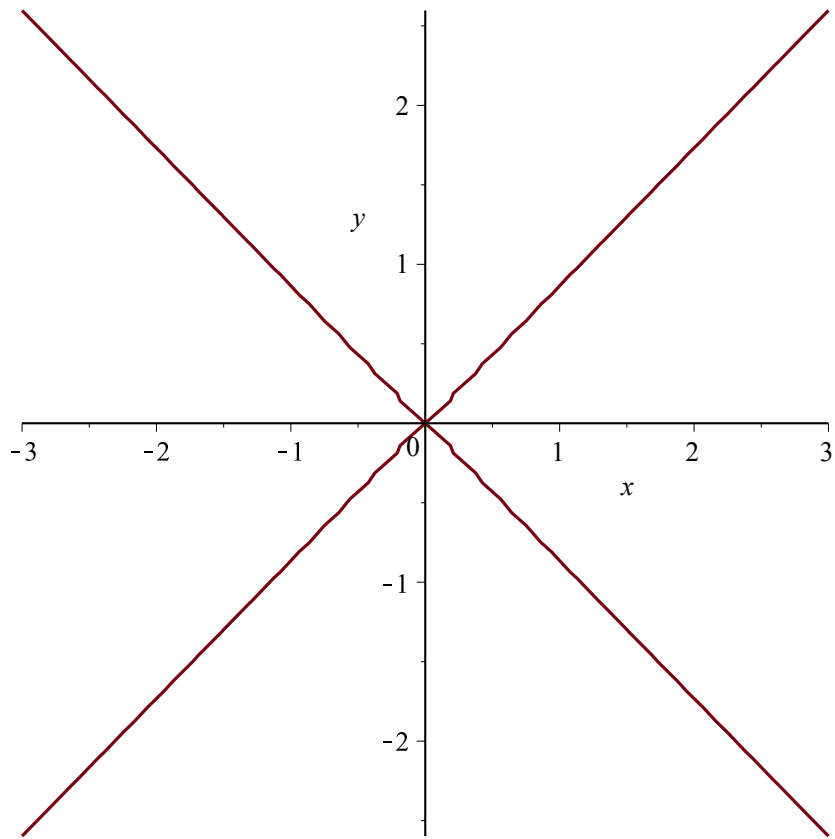
**Snittet med et koordinatplan  
xy plan - asymptoter til en hyperbel**

$$\text{implicitplot}\left(\frac{y^2}{3} - \frac{x^2}{4} = 0, x = -3 \dots 3, y = -3 \dots 3\right)$$

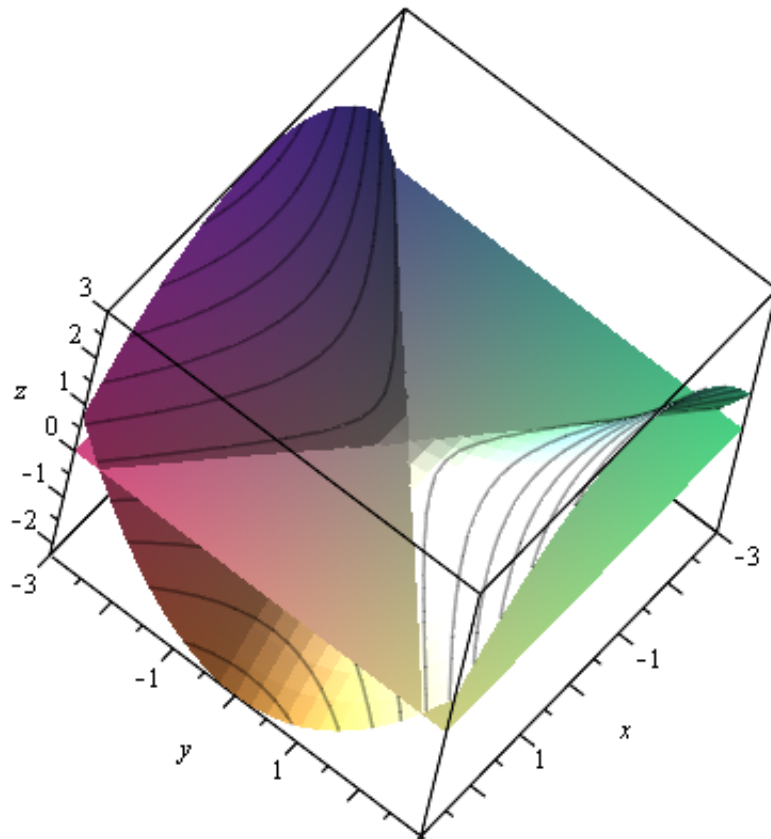


**vi får et bedre bilde hvis Maple bruker flere punkt**

*implicitplot* $\left(\frac{y^2}{3} - \frac{x^2}{4} = 0, x = -3 \dots 3, y = -3 \dots 3, \text{numpoints} = 1000\right)$

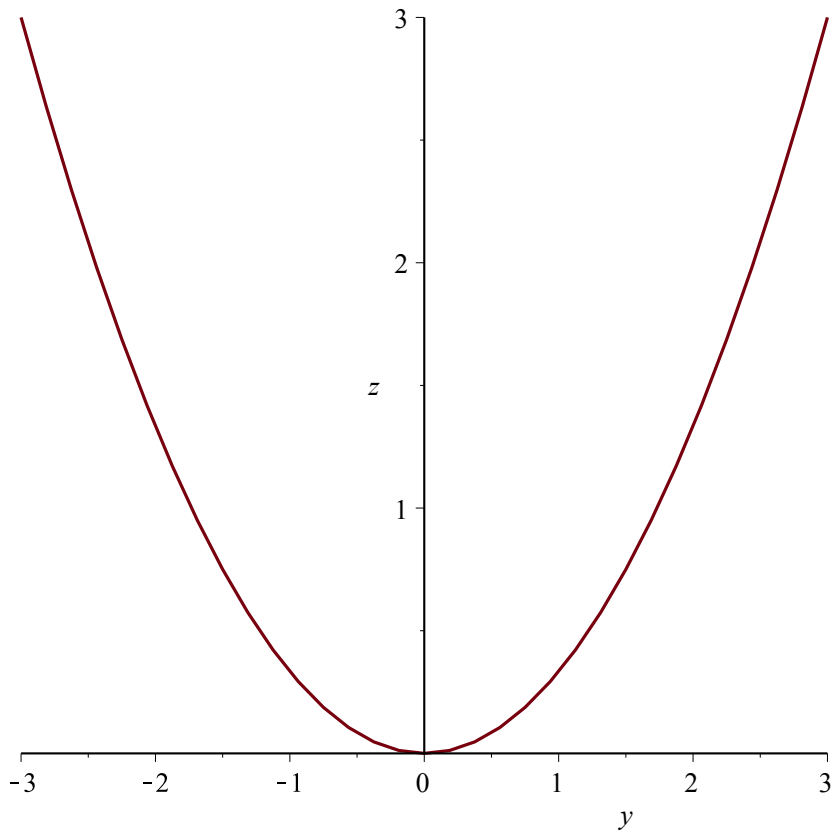


```
implicitplot3d([ $\left[\frac{y^2}{3} - \frac{x^2}{4} = z, z = 0\right]$ ,  $x = -3 \dots 3, y = -3 \dots 3, z = -3 \dots 3$ , axes = boxed, style = patchcontour,  
grid = [25, 25, 25])
```

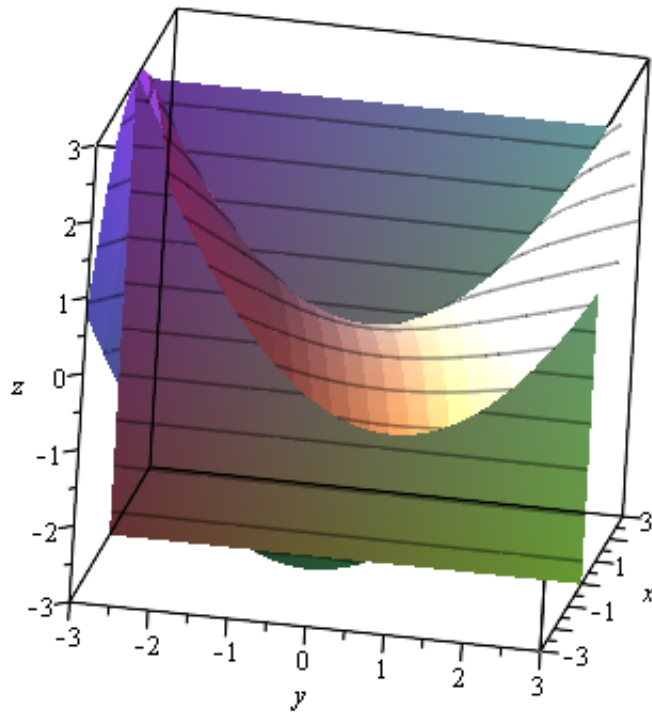


**yz plan - parabel**

`implicitplot( $\frac{y^2}{3} = z, y = -3 \dots 3, z = -3 \dots 3, \text{numpoints} = 1000$ )`

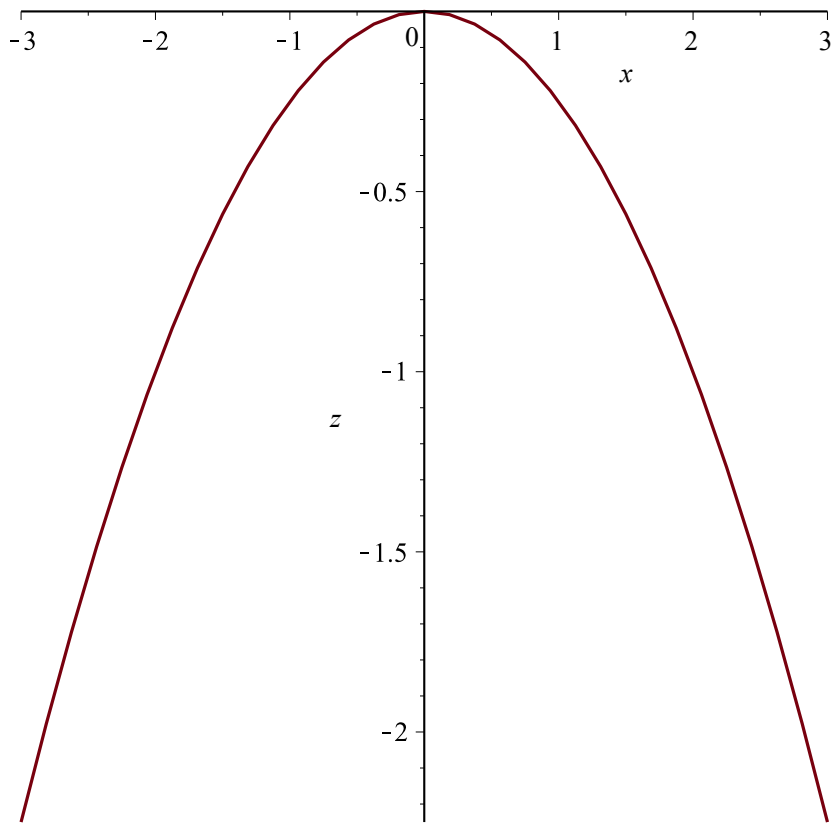


```
implicitplot3d( $\left[ \left[ \frac{y^2}{3} - \frac{x^2}{4} = z, x = 0 \right], x = -3 \dots 3, y = -3 \dots 3, z = -3 \dots 3, axes = boxed, style = patchcontour, \right.$   
 $\left. grid = [25, 25, 25] \right)$ 
```



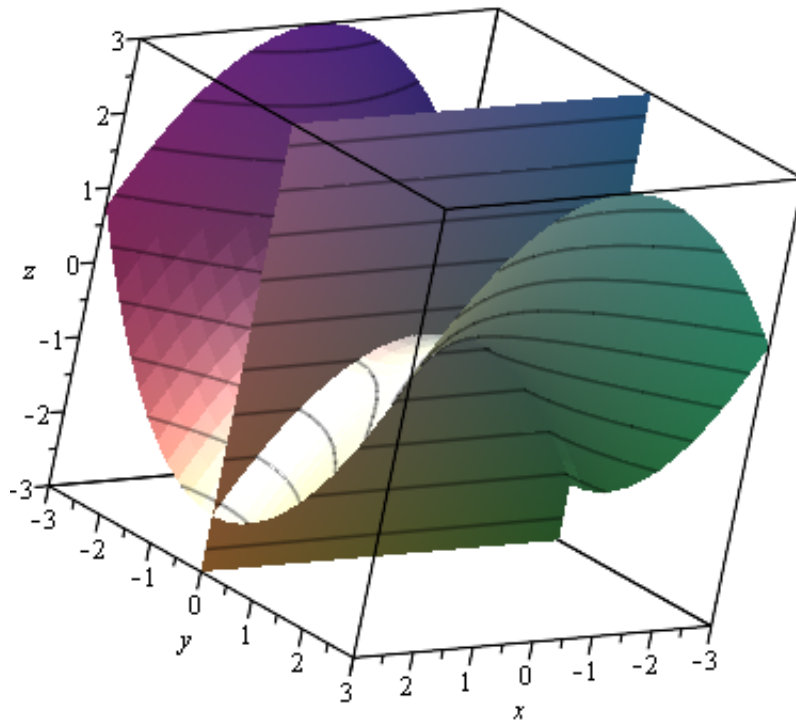
**xz plan - parabel**

*implicitplot*  $\left( -\frac{x^2}{4} = z, x = -3 \dots 3, z = -3 \dots 3, \text{numpoints} = 1000 \right)$



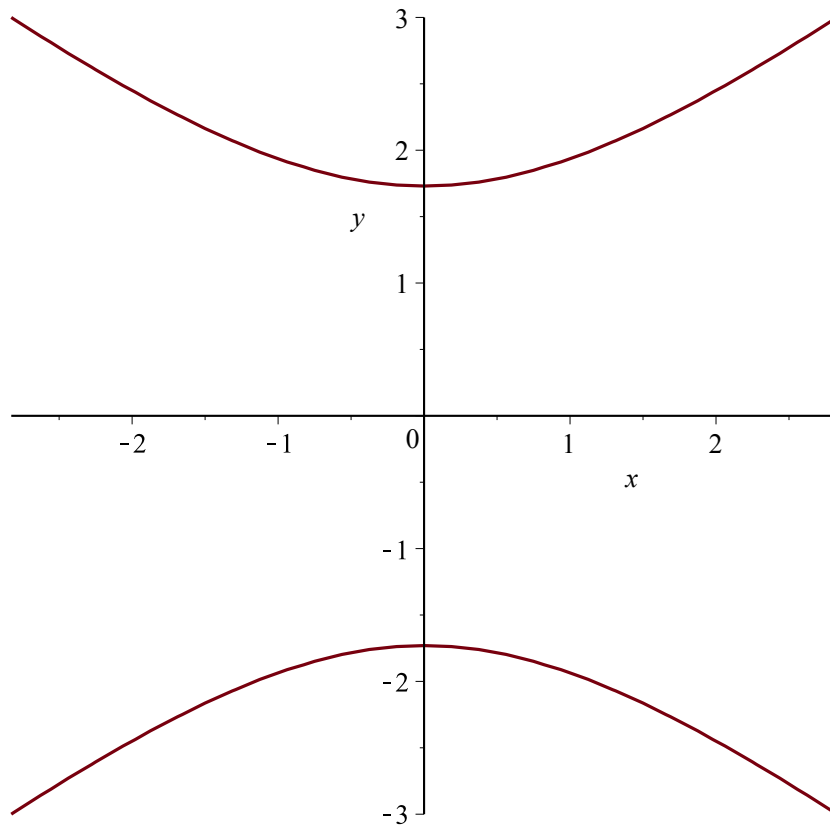
```
implicitplot3d( $\left[ \left[ \frac{y^2}{3} - \frac{x^2}{4} = z, y = 0 \right], x = -3 \dots 3, y = -3 \dots 3, z = -3 \dots 3, axes = boxed, style = patchcontour, \right.$   
 $\left. grid = [25, 25, 25] \right)$ 
```



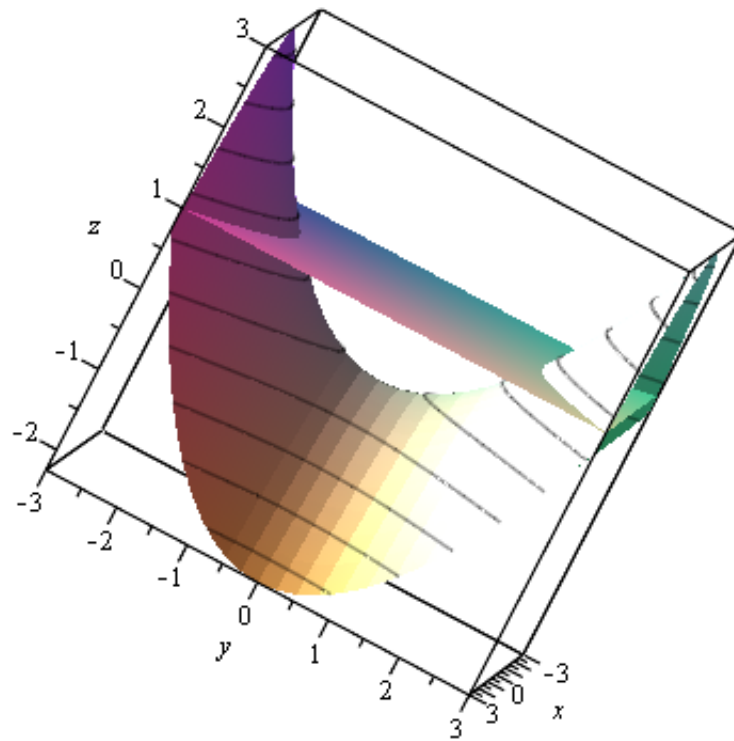


**Nivåkurve - snittet med  $z = c$  plan**  
 **$c > 0$  - hyperbel, brennpunktene på y-aksen**

$$\text{implicitplot}\left(\frac{y^2}{3} - \frac{x^2}{4} = 1, x = -3 \dots 3, y = -3 \dots 3, \text{numpoints} = 1000\right)$$

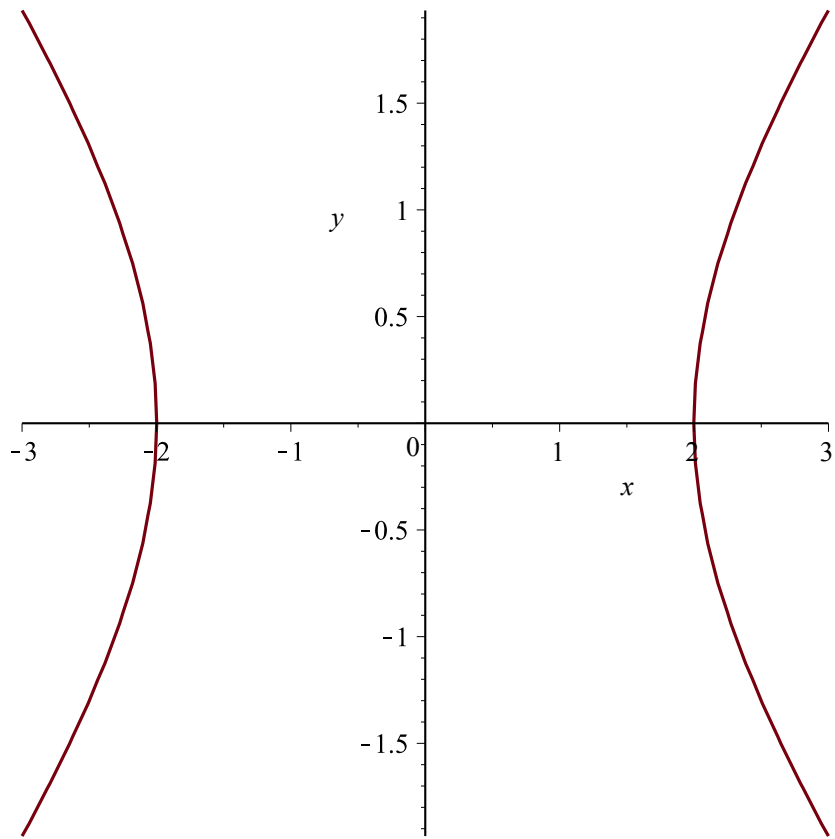


```
implicitplot3d( $\left[ \left[ \frac{y^2}{3} - \frac{x^2}{4} = z, z = 1 \right], x = -3 \dots 3, y = -3 \dots 3, z = -3 \dots 3, axes = boxed, style = patchcontour, \right.$ 
   $\left. grid = [25, 25, 25] \right)$ 
```

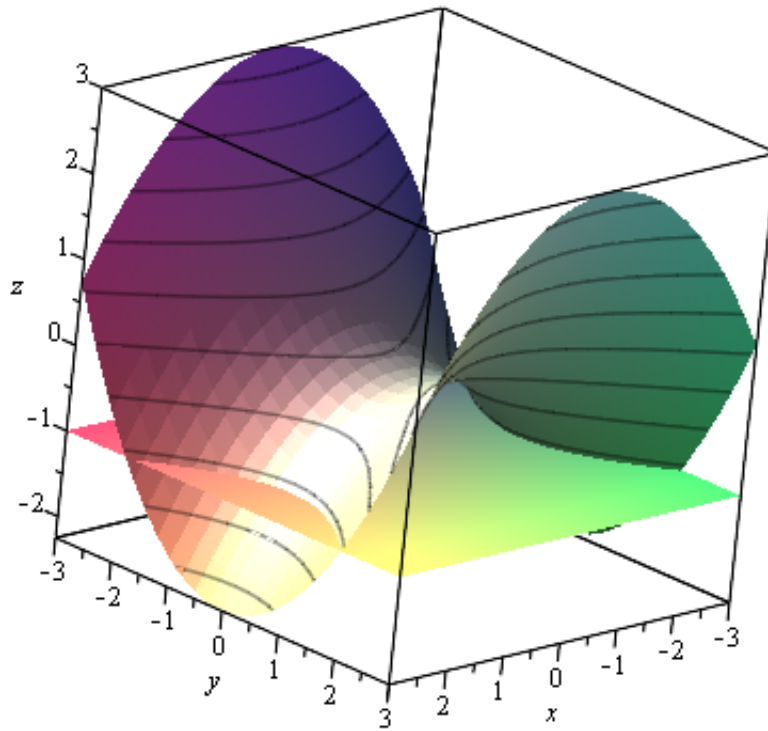


**Nivåkurve - snittet med  $z = c$  plan**  
 **$c < 0$  - hyperbel, brennpunktene på x-aksen**

$$\text{implicitplot}\left(\frac{y^2}{3} - \frac{x^2}{4} = -1, x = -3 \dots 3, y = -3 \dots 3, \text{numpoints} = 1000\right)$$

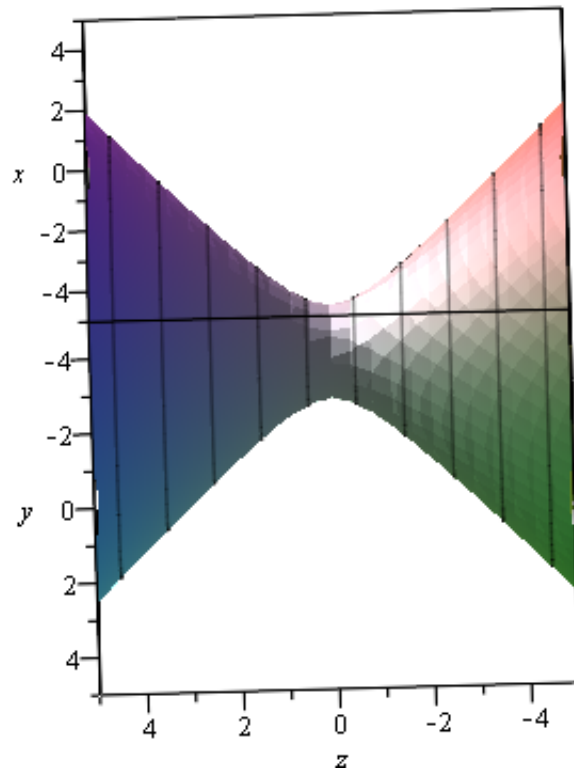


```
implicitplot3d\left(\left[\frac{y^2}{3} - \frac{x^2}{4} = z, z = -1\right], x = -3..3, y = -3..3, z = -3..3, axes = boxed, style = patchcontour, grid = [25, 25, 25]\right)
```



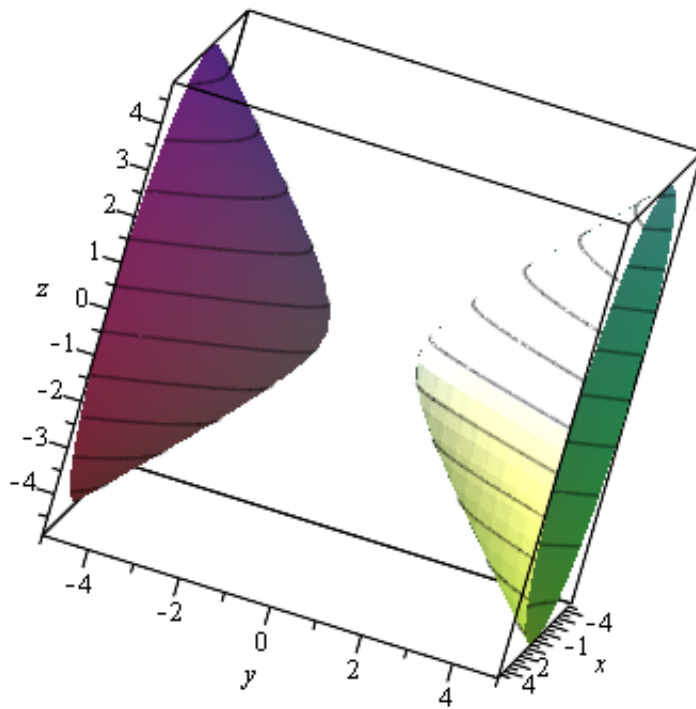
**Tegne flaten  $x^2 + y^2 - z^2 = 1$  (enkappet / enbladet hyperboloid)**

`implicitplot3d(x2 + y2 - z2 = 1, x=-5..5, y=-5..5, z=-5..5, axes = boxed, style = patchcontour, grid = [25, 25, 25])`



**Tegne flaten  $-x^2 + y^2 - z^2 = 1$  (tokappet / tobladet hyperboloid)**

`implicitplot3d(-x2 + y2 - z2 = 1, x = -5..5, y = -5..5, z = -5..5, axes = boxed, style = patchcontour, grid = [25, 25, 25])`



**hvis vi roterer hyperbelen  $y^2 - z^2 = 1$**

**- om z-aksen vi får en enkappet hyperboloid**

**- om y-aksen vi får en tokappet hyperboloid**

*implicitplot( $y^2 - z^2 = 1$ ,  $y = -5 \dots 5$ ,  $z = -5 \dots 5$ , axes = boxed)*

