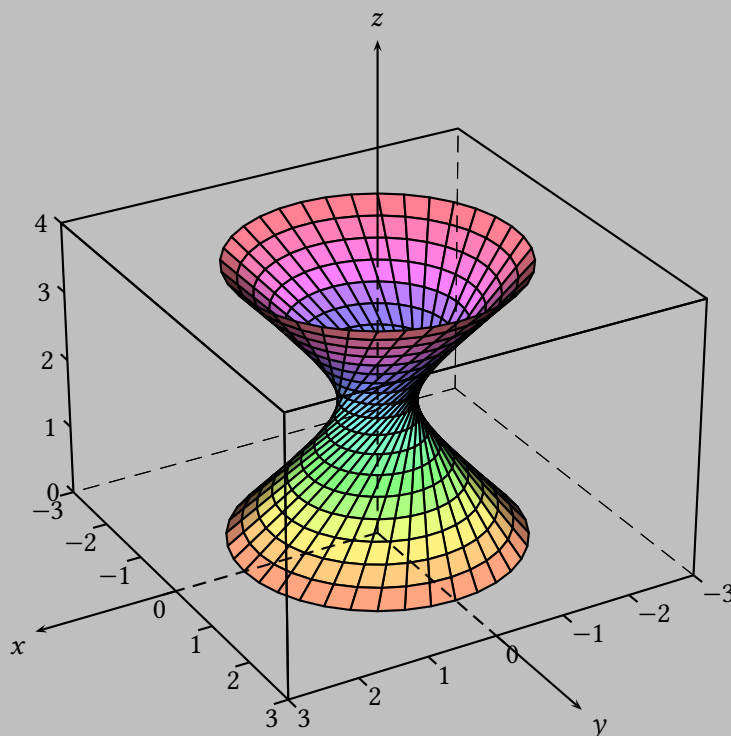


PSTricks

Hyperboloids with PSTricks

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1 Introduction

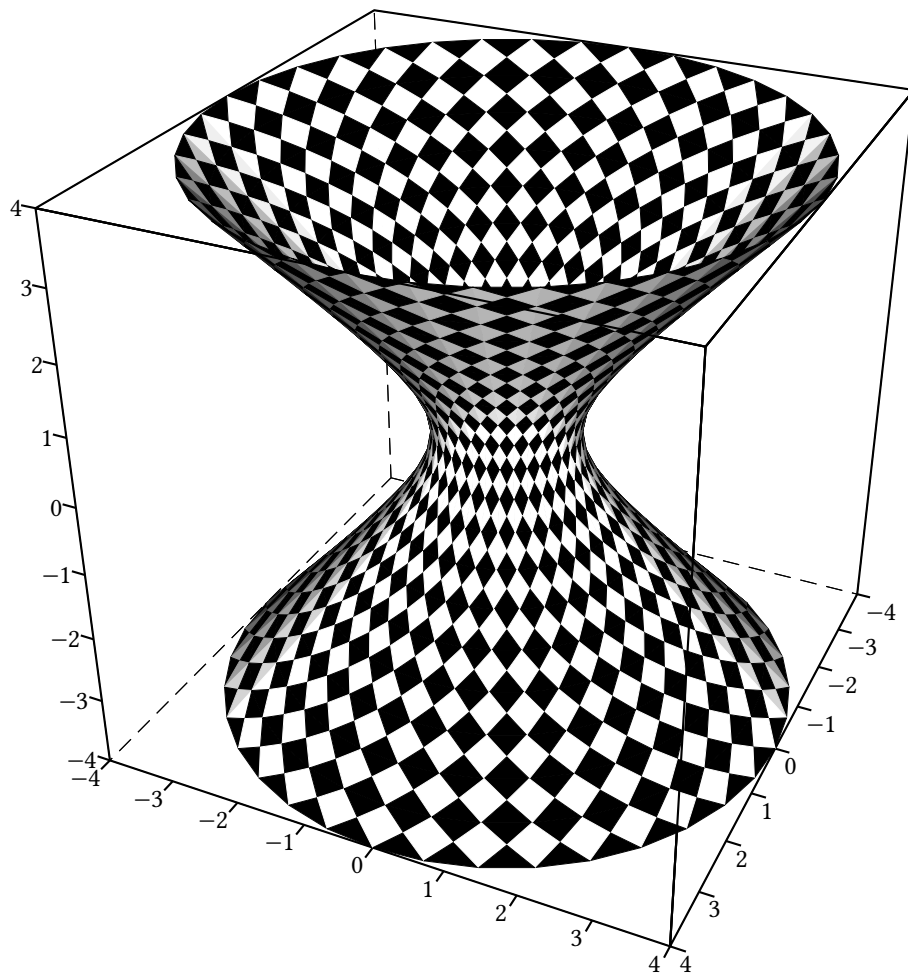
The command is `\psHyperboloid[options](x,y,z)`. The examples can be run with the sequence `latex→”dvips→”ps2p` or with `lualatex` if you want directly the `.pdf` output. Some of the examples with a splitted object needs heavy calculations which may take more than 30 minutes on slow machines!

The mesh is defined by the option `ngrid=n1 n2`, where `n1` is the number of meridians and `n2` is the number of levels. The height of the hyperboloid is defined by the option `h=8`, and the radius of the bases by `R=4` (default values). The number of inner and outer facets is calculated using the formula:

$$n_1 \times n_2 \times 4 \times 2$$

If one wishes to mesh only the exterior, the option to be used—after calculation—is:

```
fcol= n1*n2*4 2  n1*n2*4*2{
  /Rang exch def
  Rang (Blue) Rang 1 add (Yellow)
} for
```

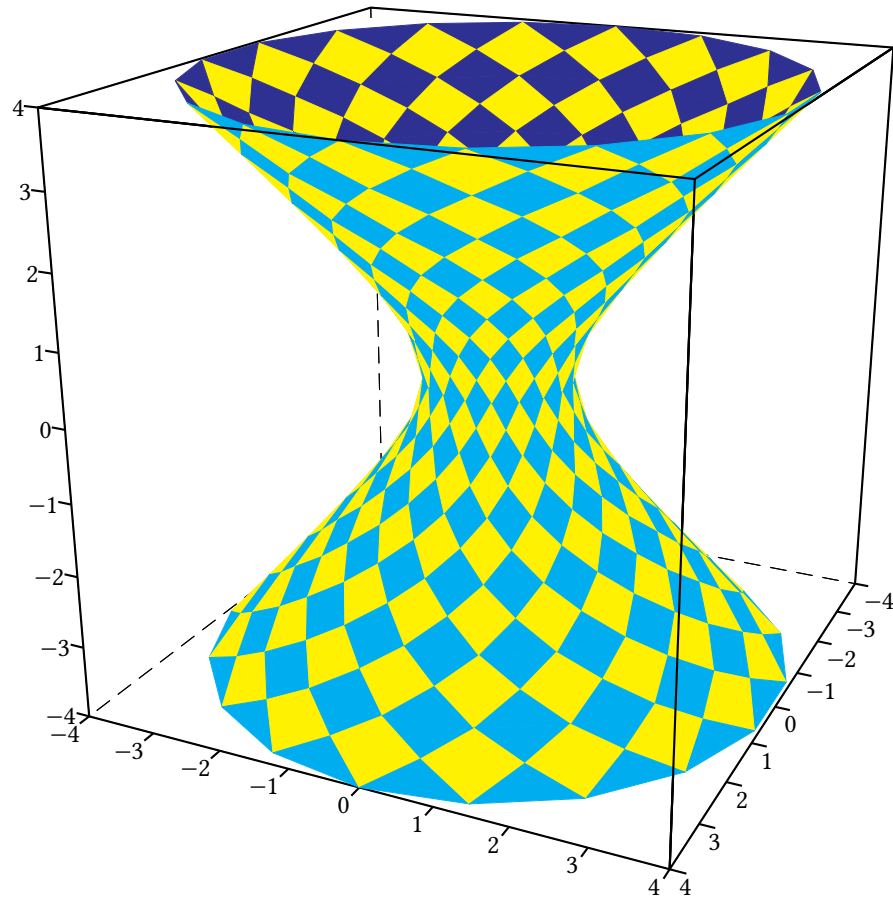


First example

```

1 \begin{pspicture}(-8,-7.2)(6,6)
2 \psset{viewpoint=25 25 30 rtp2xyz,lightsrc=viewpoint,Decran=25}
3 \gridIIID[Zmin=-4,Zmax=4,showAxes=false](-4,4)(-4,4)
4 \psHyperboloid[
5   hollow,linewidth=0.25\pslinewidth,grid,
6   % inouthue=1 0 0.5 1,
7   fcol= 0 2 5760{
8     /Rang exch def
9     Rang (Black) Rang 1 add (White)
10  } for,
11   ngrid=36 20]
12 \psLineIIID(4,-4,4)(4,4,4)(-4,4,4)
13 \psLineIIID(4,4,-4)(4,4,4)
14 \end{pspicture}

```



First example

```

1 \begin{pspicture}(-8,-7)(6,5)
2 \psset{viewpoint=25 25 20 rtp2xyz,lightsrc=,Decran=25}
3 \gridIIID[Zmin=-4,Zmax=4,showAxes=false](-4,4)(-4,4)
4 \psHyperboloid[
5   hollow,linewidth=0.25\pslinewidth,grid,% inouthue=1 0 0.5 1,
6   fcol= 0 2 862{/Rang exch def
7     Rang (Blue) Rang 1 add (Yellow)
8   } for
9   864 2 1726{/Rang exch def
10    Rang (Cyan) Rang 1 add (Yellow)
11  } for,
12  ngrid=18 12
13 ]
14 \psLineIIID(4,-4,4)(4,4,4)(-4,4,4)
15 \psLineIIID(4,4,-4)(4,4,4)
16 \end{pspicture}

```

2 Hyperboloid of one sheet

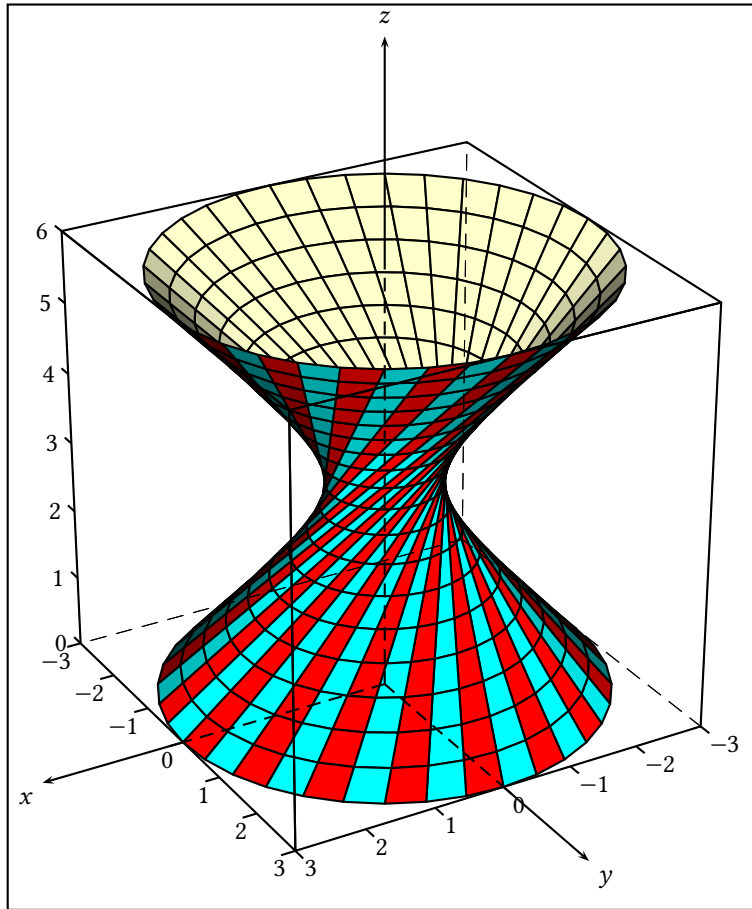
The hyperboloid of one sheet is a ruled surface. We consider the generator line $\overline{A_1A_2}$, defined by the cylinder's height H , its radius R , and the angular offset θ between the two endpoints.

From this, we derive the parametric equations for the hyperboloid:

$$\begin{cases} [L]x = R((1-k)\cos(t) + k\cos(t+\theta)) \\ y = R((1-k)\sin(t) + k\sin(t+\theta)) \\ z = kH \end{cases}$$

The parameter ranges are: $k \in [0, 1]$ and $t \in [0, 2\pi]$. The value of θ controls the constriction at the center of the hyperboloid. Depending on the sign of θ , the generator lines spiral to the right or to the left.

2.1 Examples and various possible representations

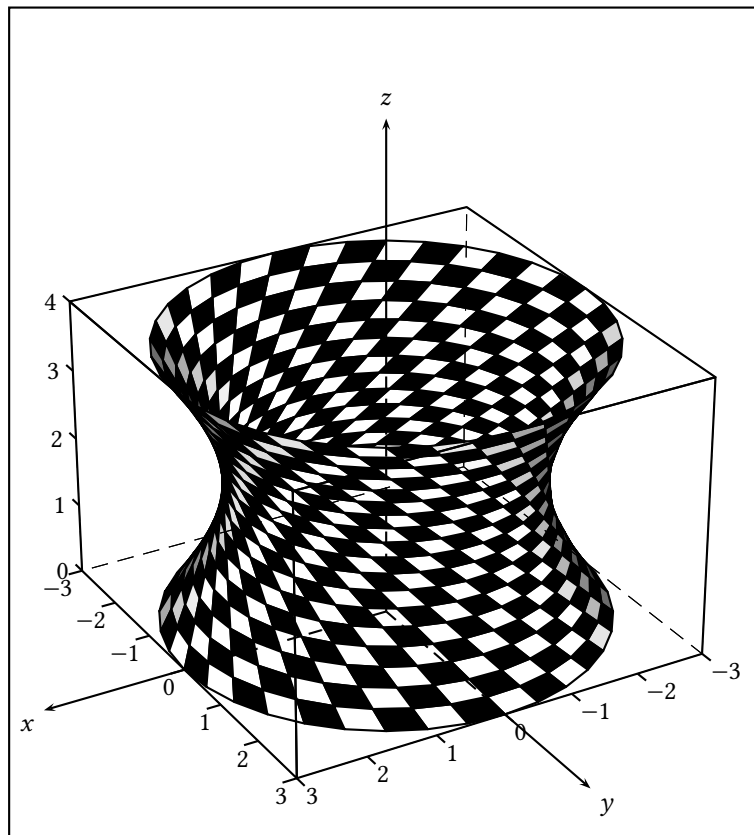


Example 1

```

1 \begin{pspicture}(-8,-3)(8,9)
2 \psset{unit=1cm}
3 \psset{viewpoint=50 60 30 rtp2xyz,lightsrc=viewpoint,Decran=50}
4 \psframe(-5,-3)(5,9)
5 \pstVerb{/iface 0 def
6           /decalage 150 3.14159265359 mul 180 div def /H 6 def /Rayon 3 def}%
7 \defFunction[algebraic]{hyperboloidonesheet}(u,v)%
8   {Rayon*(cos(u)*(1-v)+v*(cos(u+decalage)))}
9   {Rayon*(sin(u)*(1-v)+v*(sin(u+decalage)))}
10  {v*H}
11 \psSolid[object=surfaceparametree,
12   ngrid=36 18, hue=0 1 0.5 1, %fillcolor=JaunePale,
13   incol=yellow!20,%show=all,num=all,
14   fcol= 0 1 35{ % PS code for the color setting
15     /Rang exch def
16     Rang 2 div cvi 2 mul cvi
17     Rang eq {/Damier {iface (Red)} def}{/Damier {iface (Cyan)} def} ifelse
18     18 { Damier /iface iface 1 add def } repeat
19   } for, % end fcol=
20   base=0 2 Pi mul 0 1, function=hyperboloidonesheet]
21 \gridIIIID[Zmin=0,Zmax=6](-3,3)(-3,3)
22 \end{pspicture}

```

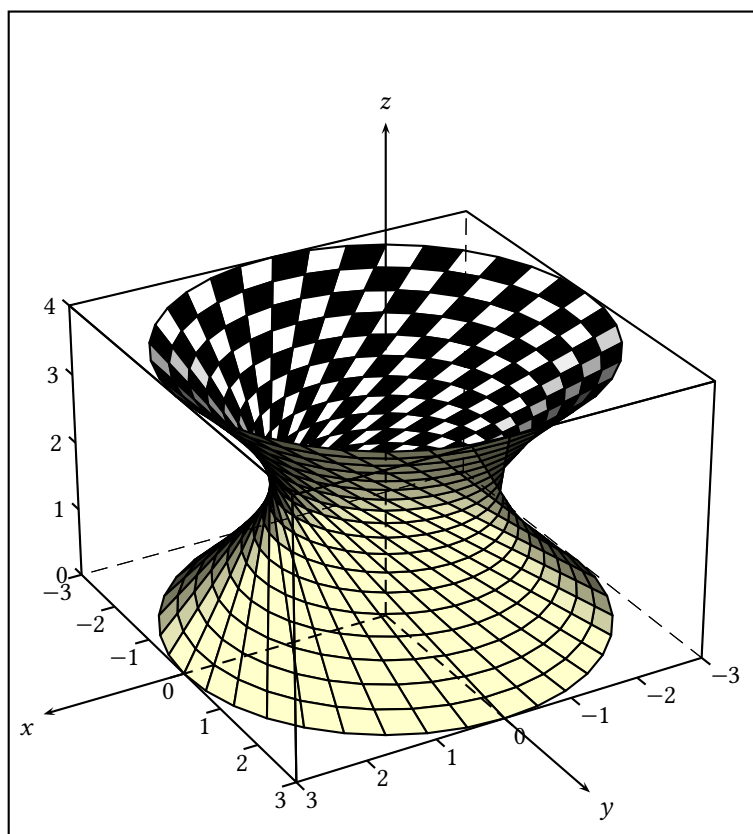


Example 2

```

1 \begin{pspicture}(-8,-3)(8,8)
2 \psset{unit=1cm}
3 \psset{viewpoint=50 60 30 rtp2xyz,lightsrc=viewpoint,Decran=50}
4 \psframe(-5,-3)(5,8)
5 \pstVerb{/iface 0 def
6           /decalage -90 3.14159265359 mul 180 div def /H 4 def /Rayon 3 def}%
7 \defFunction[algebraic]{hyperboloidonesheet}(u,v)%
8   {Rayon*(cos(u)*(1-v)+v*(cos(u+decalage)))}
9   {Rayon*(sin(u)*(1-v)+v*(sin(u+decalage)))}
10  {v*H}%
11 \psSolid[object=surfaceparametree, ngrid=36 18,
12   fcol= 0 1 71{/Rang exch def
13     Rang 2 div cvi 2 mul cvi
14     Rang eq {/Damier {iface (Black) iface 1 add (White)} def}{/Damier {iface (White) iface 1 add (Black)}
15     ↪ def}ifelse
16     9{
17       Damier
18       /iface iface 2 add def
19     } repeat
20   } for,
21   base=0 2 Pi mul 0 1, function=hyperboloidonesheet]
22 \gridIIDD[Zmin=0,Zmax=4](-3,3)(-3,3)
23 \end{pspicture}

```

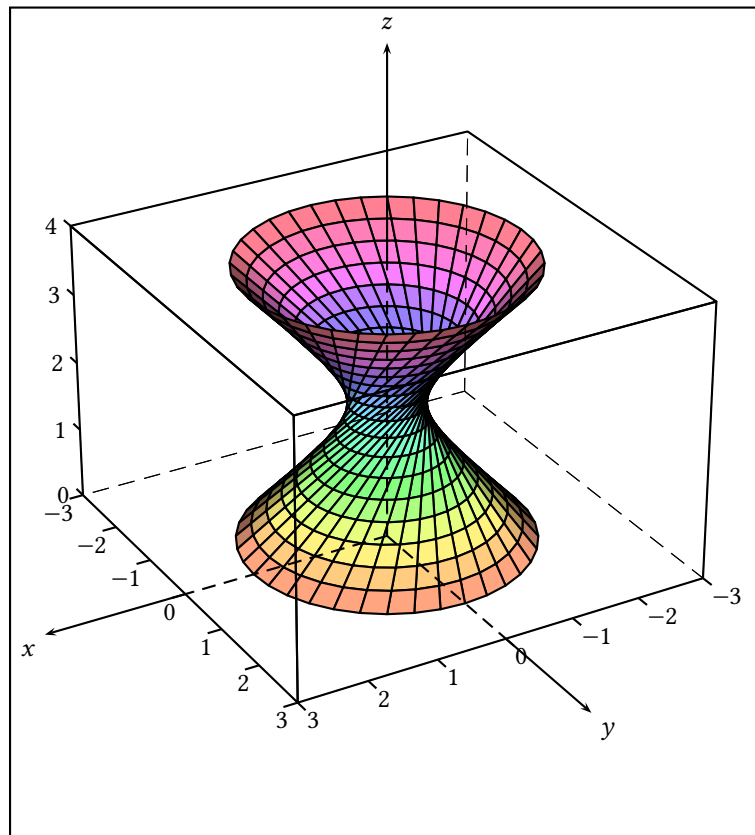


Example 3

```

1 \begin{pspicture}(-8,-3)(8,8)
2 \psset{unit=1cm}
3 \psset{viewpoint=50 60 30 rtp2xyz,lightsrc=viewpoint,Decran=50}
4 \psframe(-5,-3)(5,8)
5 \pstVerb{/iface 0 def
6           /decalage -120 3.14159265359 mul 180 div def /H 4 def /Rayon 3 def}%
7 \defFunction[algebraic]{hyperboloidonesheet}(u,v)%
8   {Rayon*(cos(u)*(1-v)+v*(cos(u+decalage)))}
9   {Rayon*(sin(u)*(1-v)+v*(sin(u+decalage)))}
10  {v*H}%
11 \psSolid[object=surfaceparametree,
12   ngrid=36 18, incolor=yellow!20,
13   fcol= 0 1 35{/Rang exch def
14     Rang 2 div cvi 2 mul cvi Rang eq {/Damier {iface (Black) iface 1 add (White)} def}{/Damier {iface (White) iface 1
15     ↪ add (Black)} def}ifelse
16     9 { Damier /iface iface 2 add def } repeat
17   } for, base=0 2 Pi mul 1 0, function=hyperboloidonesheet]
18 \gridIIO[Zmin=0,Zmax=4](-3,3)(-3,3)
19 \end{pspicture}

```



Example 3

```

1 \begin{pspicture}(-5,-4)(5,7)
2 \psset{viewpoint=50 60 30 rtp2xyz,lightsrc=viewpoint,Decran=50}
3 \psframe(-5,-4)(5,7)
4 \pstVerb{/decalage 150 3.14159265359 mul 180 div def /H 4 def /Rayon 2 def}%
5 \defFunction[algebraic]{hyperboloidonesheet}(u,v)%
6 {Rayon*(cos(u)*(1-v)+v*(cos(u+decalage)))}%
7 {Rayon*(sin(u)*(1-v)+v*(sin(u+decalage)))}%
8 {v*H}%
9 \psSolid[object=surfaceparametree,dotsize=3.5pt,
10 ngrid=36 18,
11 tablez=0 0.1 4 {} for,
12 zcolor=0 1 0.5 1,
13 base=0 2 Pi mul 1 0 ,
14 function=hyperboloidonesheet]
15 \gridIIDD[Zmin=0,Zmax=4](-3,3)(-3,3)
16 \end{pspicture}

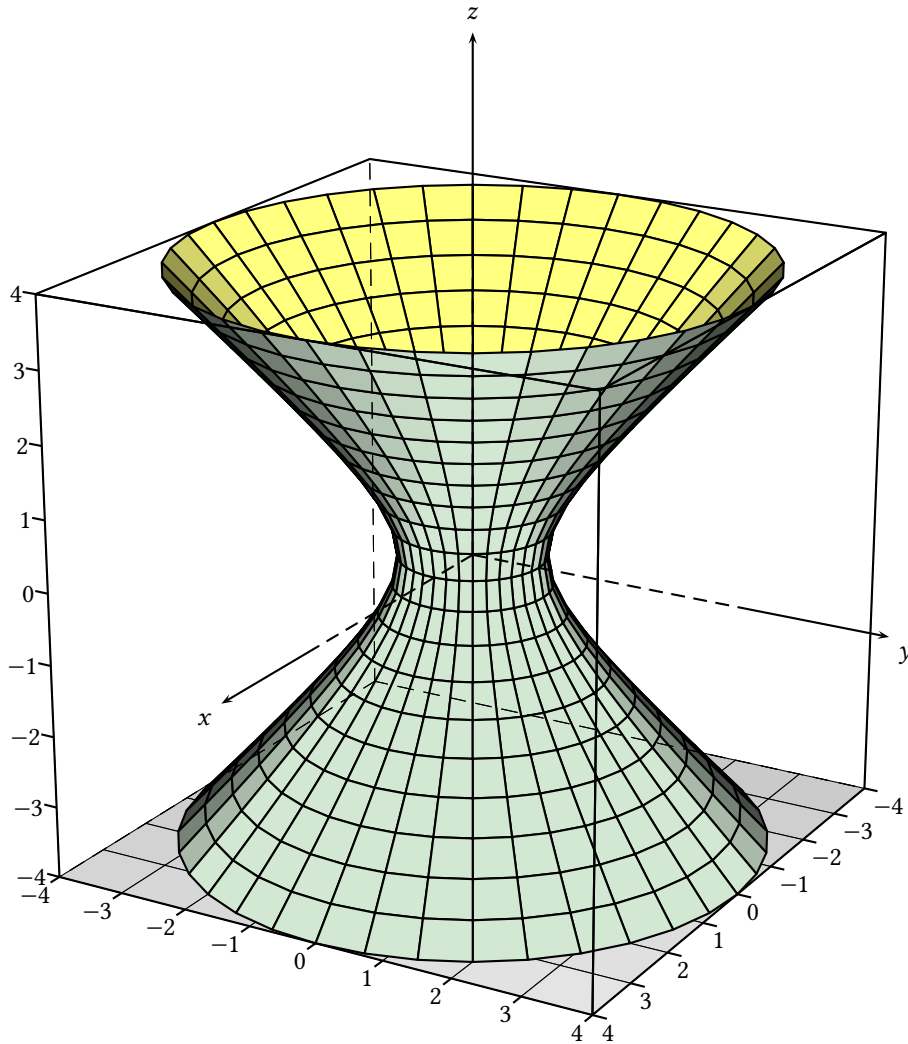
```


3 Sections of a Hyperboloid of One Sheet

The radius of the generating hyperbola varies from bottom to top, following the relation:

$$\frac{r^2}{a^2} = 4k^2 \left(\frac{R^2}{a^2} - 1 \right) + 1$$

$$r = \sqrt{4k^2(R^2 - a^2) + a^2} \text{ with } -\frac{1}{2} \leq k \leq \frac{1}{2}$$



Example 4

```

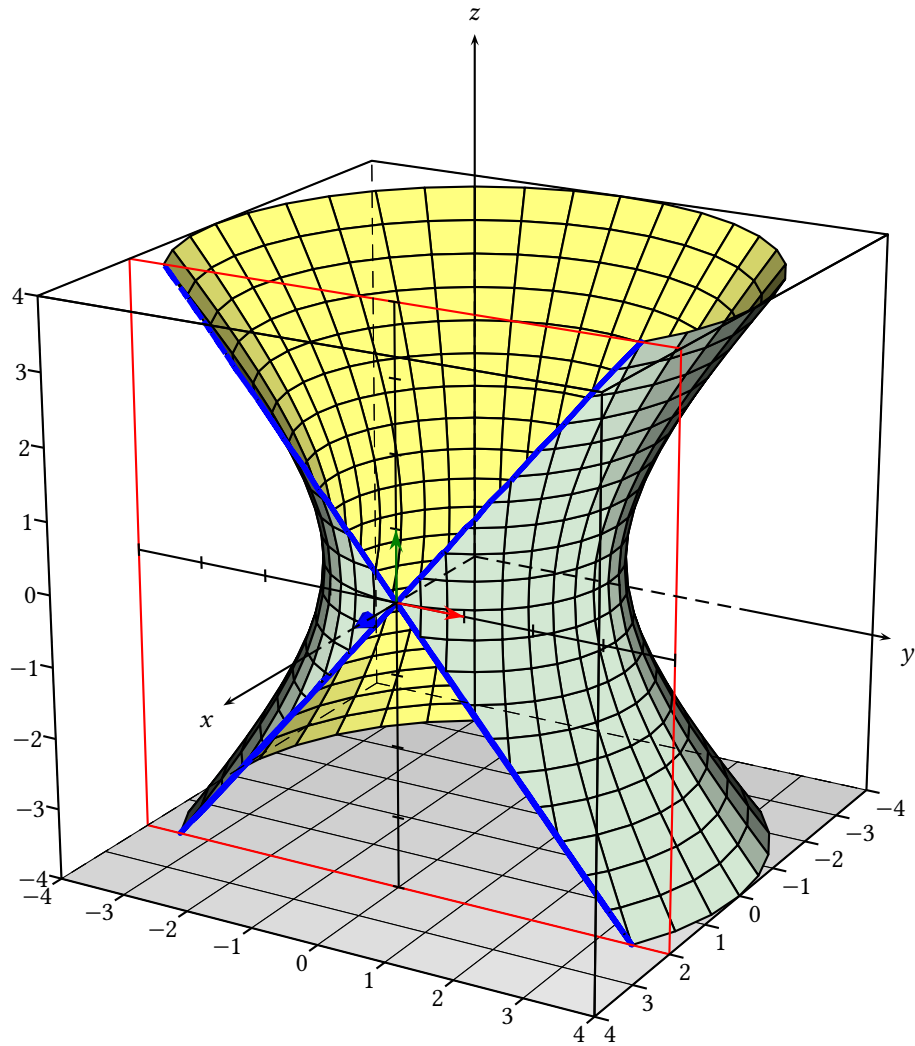
1 \begin{pspicture}(-8,-7)(8,7)
2 \psset{solidmemory, viewpoint=50 30 20 rtp2xyz,lightsrc=viewpoint,Decran=50}
3 \pstVerb{/Hauteur 8 def
4           /nEtages 20 def
5           /Pas 1 nEtages div def
6           /nMeridiens 36 def
7           /DemiAxeFocal 1 def % rayon de l'étranglement au milieu
8           /RayonBases 4 def}%
9 \psSolid[object=grille,base=-4 4 -4 4,linewidth=0.5\pslinewidth](0,0,Hauteur 2 div neg)
10 \psSolid[object=new, incolor=yellow!50, fillcolor=ForestGreen!20, hollow,
11          sommets=0.5 Pas neg -0.5 Pas neg add {
12            /k exch def
13            0 1 nMeridiens 1 sub {

```

```

14      /i exch def
15      /r 4 k dup mul mul RayonBases dup mul DemiAxeFocal dup mul sub mul
16      DemiAxeFocal dup mul add sqrt def
17      360 nMeridiens div i mul cos r mul
18      360 nMeridiens div i mul sin r mul
19      k Hauteur mul
20      } for
21      } for,
22      faces={ 0 1 nEtages 1 sub {
23      /k1 exch def
24      k1 nMeridiens mul 1 add 1 k1 1 add nMeridiens mul 1 sub {
25      /i exch def
26      [i i 1 sub nMeridiens i add 1 sub nMeridiens i add]
27      } for
28      [k1 nMeridiens mul k1 1 add nMeridiens mul 1 sub k1 2 add nMeridiens mul 1 sub k1 1 add nMeridiens mul]
29      } for
30      }]% end \pssolid
31 \gridIIID[Zmin=-4,Zmax=4](-4,4)(-4,4)
32 \end{pspicture}

```



Example 5

```

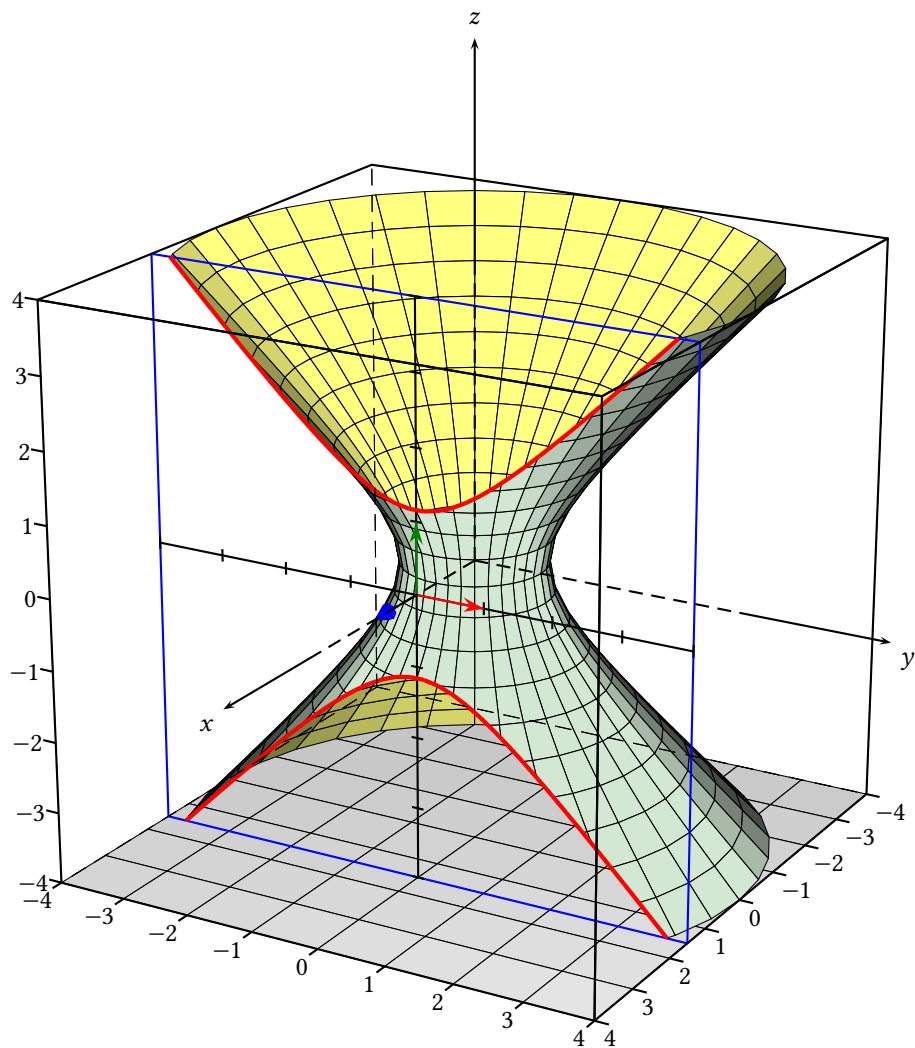
1 \begin{pspicture}(-8,-7)(8,7)
2 \psset{solidmemory,viewpoint=50 30 20 rtp2xyz,lightsrc=viewpoint,Decran=50}
3 \pstVerb{/Hauteur 8 def
4           /nEtages 20 def
5           /Pas 1 nEtages div def
6           /nMeridiens 36 def
7           /DemiAxeFocal 2 def % rayon de l'étranglement au milieu
8           /RayonBases 4 def}%
9 \psSolid[object=grille,base=-4 4 -4 4,linewidth=0.5\pslinewidth](0,0,Hauteur 2 div neg)
10 \psSolid[object=new,fillcolor=red!50,incolor=yellow,hollow,action=draw**,
11 sommets=0.5 Pas neg -0.5 Pas neg add{
12   /k exch def
13   0 1 nMeridiens 1 sub {
14     /i exch def
15     /r 4 k dup mul mul RayonBases dup mul DemiAxeFocal dup mul sub mul DemiAxeFocal dup mul add sqrt def
16     360 nMeridiens div i mul cos r mul
17     360 nMeridiens div i mul sin r mul
18     k Hauteur mul
19   } for
20 } for,
21 faces={
22   0 1 nEtages 1 sub {
23     /k1 exch def
24     k1 nMeridiens mul 1 add 1 k1 1 add nMeridiens mul 1 sub {

```

```

25     /i exch def
26     [i i 1 sub nMeridiens i add 1 sub nMeridiens i add]
27     } for
28     [k1 nMeridiens mul k1 1 add nMeridiens mul 1 sub k1 2 add nMeridiens mul 1 sub k1 1 add nMeridiens mul]
29     } for
30     },
31     plansepare={[1 0 0 DemiAxeFocal neg]}, name=coupeHyperboloidTest,action=none]
32 \psSolid[object=load,incolor=yellow!50,fillcolor=ForestGreen!20,rm=2 609,
33     intersectionplan={[1 0 0 DemiAxeFocal neg]},intersectioncolor=(bleu), intersectionlinewidth=2,
34     intersectiontype=0, load=coupeHyperboloidTest1]
35 \psSolid[object=plan, definition=equation,args={[1 0 0 DemiAxeFocal neg] 90},linecolor=red,
36 %     fillcolor=Aquamarine,
37     planmarks,base=-4 4 -4 4,showBase,action=draw]
38 \gridIIID[Zmin=-4,Zmax=4](-4,4)(-4,4)
39 \end{pspicture}

```



Example 6

```

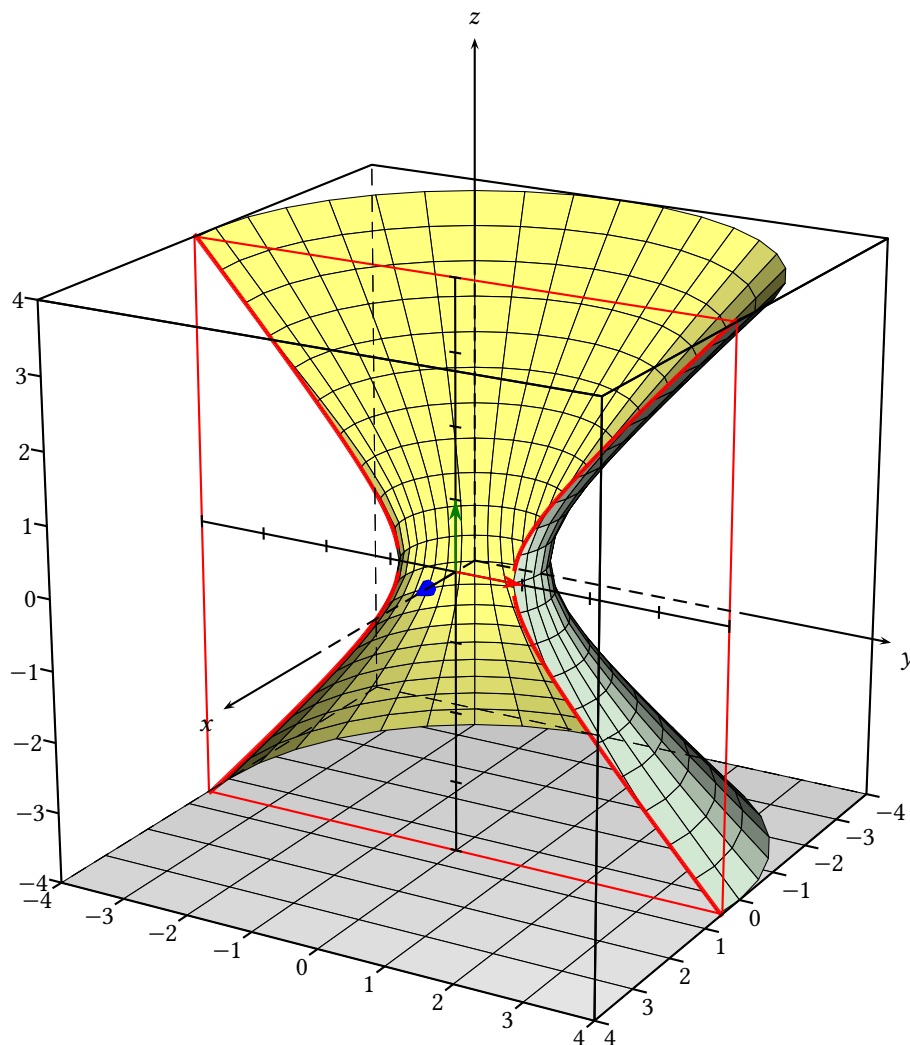
1 \begin{pspicture}(-8,-7)(8,7)
2 \psset{solidmemory, viewpoint=50 30 20 rtp2xyz,lightsrc=viewpoint,Decran=50}
3 \pstVerb{/Hauteur 8 def /nEtages 20 def
4 /Pas 1 nEtages div def /nMeridiens 36 def
5 /DemiAxeFocal 1 def % rayon de l'étranglement au milieu
6 /RayonBases 4 def
7 /DemiAxeNonFocal Hauteur 2 div RayonBases dup mul DemiAxeFocal dup mul sub sqrt div DemiAxeFocal mul def
8 /X0 1.5 def /Z0 DemiAxeNonFocal X0 DemiAxeFocal div dup mul 1 sub sqrt mul def
9 /Ymax DemiAxeFocal Hauteur 2 DemiAxeNonFocal mul div dup mul 1 add X0 DemiAxeFocal div dup mul sub sqrt mul
  ↪ def}%
10 \psSolid[object=grille,base=-4 4 -4 4,linewidth=0.5\pslinewidth](0,0,Hauteur 2 div neg)
11 \psSolid[object=new,incolor=yellow!50, fillcolor=ForestGreen!20, hollow,
12 sommets=
13 0.5 Pas neg -0.5 Pas neg add{
14 /k exch def
15 0 1 nMeridiens 1 sub {
16 /i exch def
17 /r 4 k dup mul mul RayonBases dup mul DemiAxeFocal dup mul sub mul DemiAxeFocal dup mul add sqrt def
18 360 nMeridiens div i mul cos r mul
19 360 nMeridiens div i mul sin r mul
20 k Hauteur mul
21 } for
22 } for,
23 faces={ 0 1 nEtages 1 sub {

```

```

24 /k1 exch def
25 k1 nMeridiens mul 1 add 1 k1 1 add nMeridiens mul 1 sub {
26 /i exch def
27 [i i 1 sub nMeridiens i add 1 sub nMeridiens i add]
28 } for
29 [k1 nMeridiens mul k1 1 add nMeridiens mul 1 sub k1 2 add nMeridiens mul 1 sub k1 1 add nMeridiens mul]
30 } for},
31 plansepare=[1 0 0 -1.5]],name=coupeHyperboloidTest,action=none]
32 \psSolid[object=load,deactivatecolor=true, %fillcolor=red!50,incolor=yellow,rm=0,
33 linewidth=0.5\pslinewidth,rm=0,load=coupeHyperboloidTest1]
34 \psSolid[object=plan,definition=equation,args=[1 0 0 -1.5] 90},linecolor=blue,% fillcolor=Aquamarine,
35 planmarks,base=-4 4 -4 4,name=PlanCoupe,showBase,action=draw]
36 \defFunction[algebraic]{hyperbol1}(t){X0}{t}{sqrt(((X0^2+t^2)/(DemiAxeFocal^2)-1))*DemiAxeNonFocal}
37 \defFunction[algebraic]{hyperbol2}(t){X0}{t}{-sqrt(((X0^2+t^2)/(DemiAxeFocal^2)-1))*DemiAxeNonFocal}
38 \psSolid[object=courbe,linewidth=2\pslinewidth,function=hyperbol1,range=Ymax neg Ymax,r=0,linecolor=red]%
39 \psSolid[object=courbe,linewidth=2\pslinewidth,function=hyperbol2,range=Ymax neg Ymax,r=0,linecolor=red]%
40 \gridIIID[Zmin=-4,Zmax=4](-4,4)(-4,4)
41 \end{pspicture}

```



Example 6

```

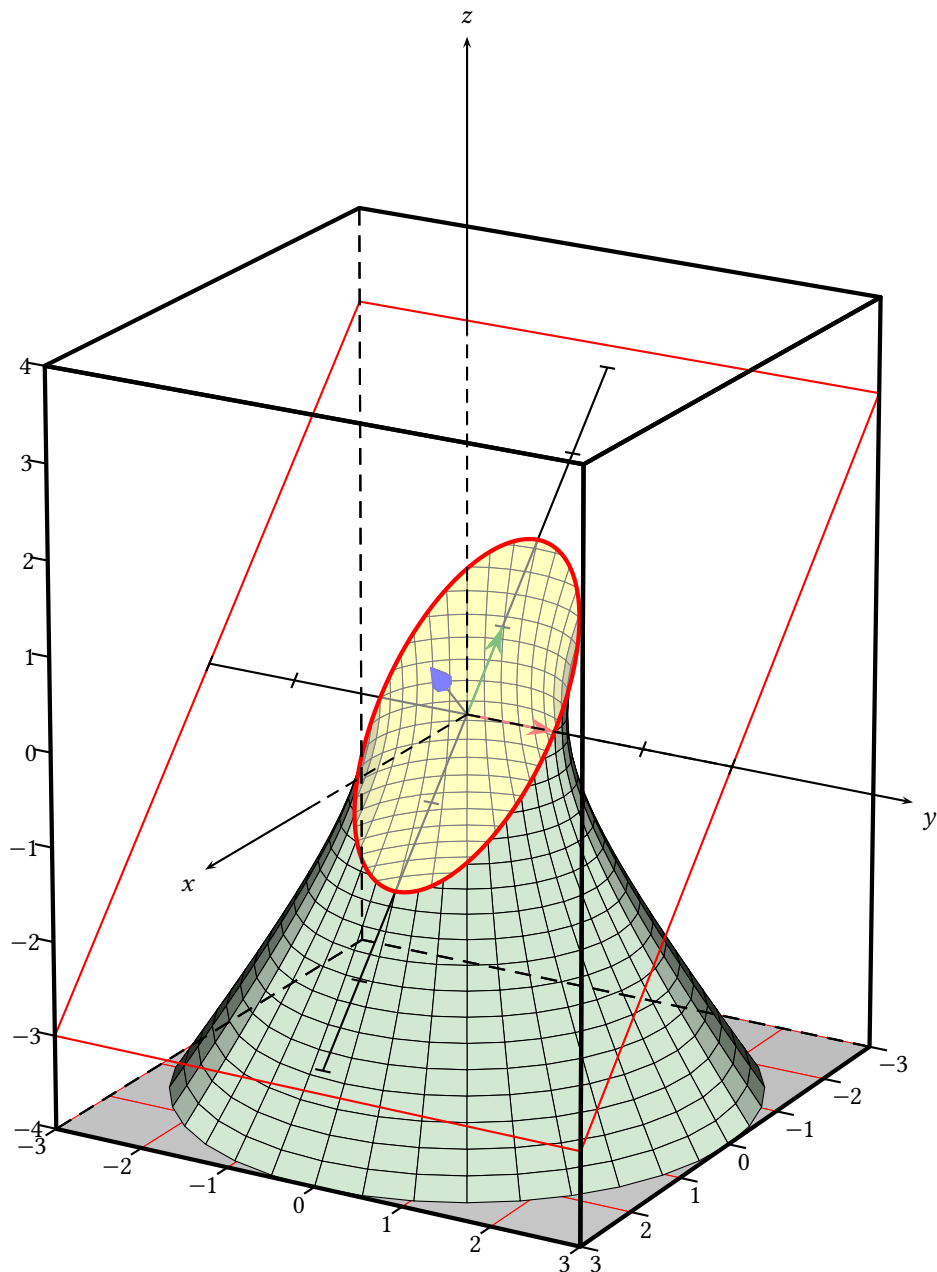
1 \begin{pspicture}(-8,-7)(8,7)
2 \psset{solidmemory,viewpoint=50 30 20 rtp2xyz,lightsrc=viewpoint,Decran=50,resolution=200}
3 \pstVerb{/Hauteur 8 def /nEtages 20 def
4 /Pas 1 nEtages div def /nMeridiens 36 def
5 /DemiAxeFocal 1 def % rayon de l'étrangement au milieu
6 /RayonBases 4 def
7 /DemiAxeNonFocal Hauteur 2 div RayonBases dup mul DemiAxeFocal dup mul sub sqrt div DemiAxeFocal mul def
8 /X0 0.5 def /Y0 DemiAxeFocal 1 X0 DemiAxeFocal div dup mul sub sqrt mul def
9 /Ymax RayonBases def}%
10 \psSolid[object=grille,base=-4 4 -4 4,linewidth=0.5\pslinewidth](0,0,Hauteur 2 div neg)%
11 \psSolid[object=new,fillcolor=red!50,incolor=yellow,hollow,action=draw**,
12 sommets=
13 0.5 Pas neg -0.5 Pas neg add{
14 /k exch def
15 0 1 nMeridiens 1 sub {
16 /i exch def
17 /r 4 k dup mul mul RayonBases dup mul DemiAxeFocal dup mul sub mul DemiAxeFocal dup mul add sqrt def
18 360 nMeridiens div i mul cos r mul
19 360 nMeridiens div i mul sin r mul
20 k Hauteur mul
21 } for
22 } for
23 0 1 nMeridiens 1 sub {/J exch def
24 RayonBases 360 nMeridiens div J mul cos mul

```

```

25 RayonBases 360 nMeridiens div J mul sin mul
26 Hauteur 2 div } for,
27 faces={
28   0 1 nEtages 1 sub {
29     /k1 exch def
30     k1 nMeridiens mul 1 add 1 k1 1 add nMeridiens mul 1 sub {
31       /i exch def
32       [i i 1 sub nMeridiens i add 1 sub nMeridiens i add]
33     } for
34     [k1 nMeridiens mul k1 1 add nMeridiens mul 1 sub k1 2 add nMeridiens mul 1 sub k1 1 add nMeridiens mul]
35   } for},
36 plansepare={[1 0 0 -0.5]},name=coupeHyperboloidTest, action=none]
37 \psSolid[object=load,incolor=yellow!50,fillcolor=ForestGreen!20,linewidth=0.5\pslinewidth,
38   rm=0 1,%numfaces=all,%rm=0,
39   % intersectionplan={[1 0 0 -0.5]},
40   % intersectioncolor=(bleu),
41   % intersectionlinewidth=2,
42   % intersectiontype=0,
43   load=coupeHyperboloidTest1]
44 \defFunction[algebraic]{hyperbol3}(t){X0}{t}{DemiAxeNonFocal*sqrt((t^2+X0^2)/(DemiAxeFocal^2)-1)}
45 \defFunction[algebraic]{hyperbol4}(t){X0}{t}{-DemiAxeNonFocal*sqrt((t^2+X0^2)/(DemiAxeFocal^2)-1)}
46 \psSolid[object=courbe,linewidth=2\pslinewidth,function=hyperbol3,range=Y0 neg -4,
47   r=0,linecolor=red]%
48 \psSolid[object=courbe,linewidth=2\pslinewidth,
49   function=hyperbol3,range=Y0 4,r=0,linecolor=red]%
50 \psSolid[object=courbe,linewidth=2\pslinewidth,
51   function=hyperbol4,range=Y0 4,r=0,linecolor=red]%
52 \psSolid[object=courbe,linewidth=2\pslinewidth,
53   function=hyperbol4,range=Y0 neg -4,r=0,linecolor=red]%
54 \psSolid[object=plan, definition=equation,args={[1 0 0 -0.5] 90},linecolor=red,
55   planmarks, base=-4 4 -4 4, showBase,action=draw
56 ]
57 \gridIIID[Zmin=-4,Zmax=4](-4,4)(-4,4)
58 %\psPoint(X0,Y0,0){P}\psdot(P)
59 \end{pspicture}

```

Example 7

```

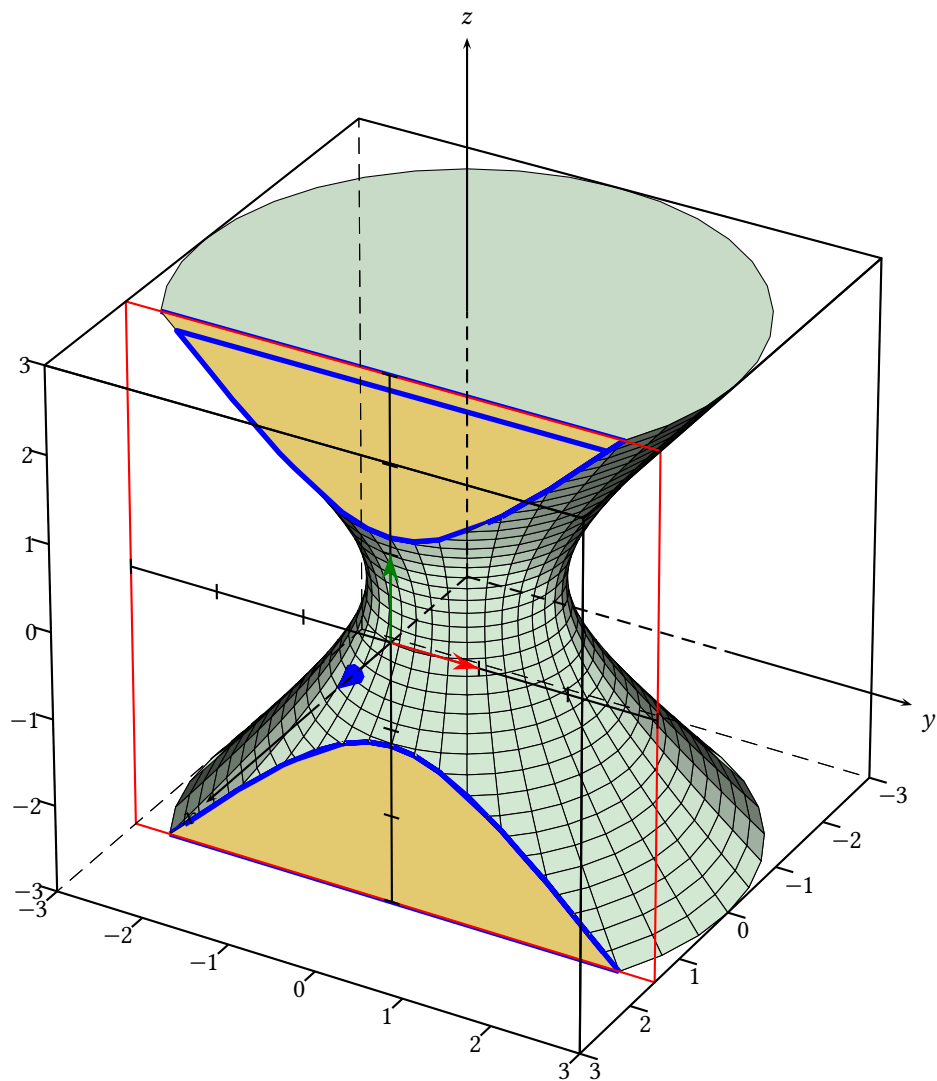
1 \begin{pspicture}(-8,-7)(8,9)
2 \psset{solidmemory,viewpoint=100 30 20 rtp2xyz,lightsrc=viewpoint,Decran=133}
3 \pstVerb{/Hauteur 8 def /nEtages 36 def
4 /Pas 1 nEtages div def /nMeridiens 36 def
5 /DemiAxeFocal 1 def % rayon de l'étranglement au milieu
6 /RayonBases 3 def
7 /DemiAxeNonFocal Hauteur 2 div RayonBases dup mul DemiAxeFocal dup mul sub sqrt div DemiAxeFocal mul def
8 /xMax DemiAxeNonFocal DemiAxeFocal mul DemiAxeNonFocal dup mul DemiAxeFocal dup mul sub sqrt div def
9 /GrandAxe xMax 2 sqrt mul def}%
10 \psSolid[object=grille,base=-3 3 -3 3,linewidth=0.5\pslinewidth,linecolor=red](0,0,Hauteur 2 div neg)%
11 \psSolid[object=new,fillcolor=red!50,incolor=yellow,%hollow,
12 action=draw*,
13 sommets=
14 0.5 Pas neg -0.5 Pas neg add{
15 /k exch def
16 0 1 nMeridiens 1 sub {

```

```

17 /i exch def
18 /r 4 k dup mul mul RayonBases dup mul DemiAxeFocal dup mul sub mul DemiAxeFocal dup mul add sqrt def
19 360 nMeridiens idiv i mul cos r mul
20 360 nMeridiens idiv i mul sin r mul
21 k Hauteur mul
22 } for
23 } for,
24 faces={
25 0 1 nEtages 1 sub {
26 /k1 exch def
27 k1 nMeridiens mul 1 add 1 k1 1 add nMeridiens mul 1 sub {
28 /i exch def
29 [i i 1 sub nMeridiens i add 1 sub nMeridiens i add]
30 } for
31 [k1 nMeridiens mul k1 1 add nMeridiens mul 1 sub k1 2 add nMeridiens mul 1 sub k1 1 add nMeridiens mul]
32 } for
33 % faces du dessus et de dessous
34 %[0 1 nMeridiens 1 sub {}for]
35 %[nMeridiens nEtages 1 add mul 1 sub -1 nMeridiens nEtages mul {}for ]
36 },plansepare={{[1 0 1 0]}, name=coupeHyperboloidTest,action=none]
37 \psSolid[object=load,incolor=yellow!50, fillcolor=ForestGreen!20,linewidth=0.5\pslinewidth,
38 rm=0,load=coupeHyperboloidTest1,hollow=true](0,0,0)
39 \defFunction[algebraic]{ellipse}(t){DemiAxeFocal*cos(t)}{GrandAxe*sin(t)}{}}
40 \psSolid[object=plan,definition=equation,args={{[1 0 1 0] 90}},linecolor=red,fillcolor=Aquamarine,
41 planmarks, base=-3 3 -3 2 sqrt mul 3 2 sqrt mul,showBase,action=draw
42 ]%
43 \defFunction[algebraic]{ellipse}(t){DemiAxeFocal*cos(t)}{GrandAxe*sin(t)}{}}
44 \psSolid[object=plan,definition=equation,
45 args={{[1 0 1 0] 90}},base=-10 10 -10 10,action=none,name=monplan]%
46 \psProjection[object=courbeR2,plan=monplan,range=0 2 pi mul,resolution=360,
47 linecolor=red,fillstyle=solid,opacity=0.5,linewidth=2\pslinewidth,function=ellipse
48 ]%
49 \composeSolid
50 %\psPoint(0,DemiAxeFocal,0){F}\psdot(F)
51 %\psPoint(xMax neg,0,xMax){F2}\psdot[linecolor=red](F2)
52 \gridIIID[Zmin=-4,Zmax=4,linewidth=1\pslinewidth](-3,3)(-3,3)
53 \end{pspicture}

```



Example 8

```

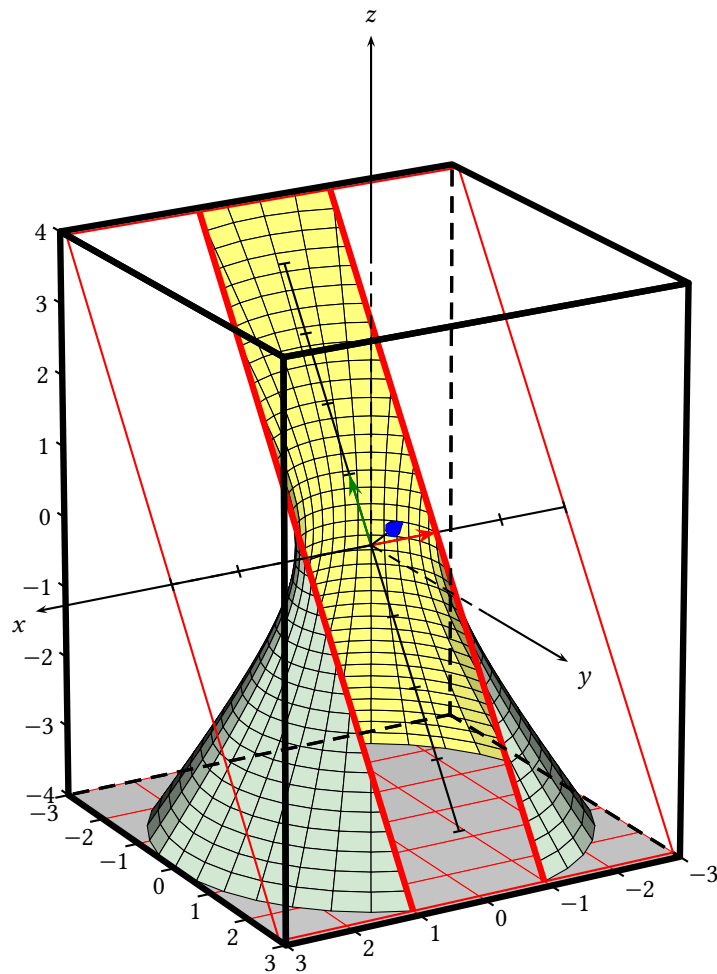
1 \begin{pspicture}(-8,-7)(8,7)
2 \psset{solidmemory,viewpoint=100 30 30 rtp2xyz,lightsrc=viewpoint,Decran=133}
3 \pstVerb{/Hauteur 6 def /nEtages 36 def
4 /Pas 1 nEtages div def /nMeridiens 36 def
5 /DemiAxeFocal 1 def % rayon de l'étranglement au milieu
6 /RayonBases 3 def /JaunePale {0.89 0.79 0.435 setrgbcolor} def}%
7 \psSolid[object=new,fillcolor=red!50,incolor=yellow,%hollow,
8 action=draw*,sommets=
9 0.5 Pas neg -0.5 Pas neg add{
10 /k exch def
11 0 1 nMeridiens 1 sub {
12 /i exch def
13 /r 4 k dup mul RayonBases dup mul DemiAxeFocal dup mul sub mul add sqrt def
14 360 nMeridiens idiv i mul cos r mul
15 360 nMeridiens idiv i mul sin r mul
16 k Hauteur mul
17 } for
18 } for,
19 faces={
20 %face du dessus
21 [0 1 nMeridiens 1 sub {}for]
22 % les faces latérales
23 0 1 nEtages 1 sub {

```

```

24 /k1 exch def
25 k1 nMeridiens mul 1 add 1 k1 1 add nMeridiens mul 1 sub {
26 /i exch def
27 [i i 1 sub nMeridiens i add 1 sub nMeridiens i add]
28 } for
29 [k1 nMeridiens mul k1 1 add nMeridiens mul 1 sub k1 2 add nMeridiens mul 1 sub k1 1 add nMeridiens mul]
30 } for
31 % face de dessous
32 %[nMeridiens nEtages 1 add mul 1 sub -1 nMeridiens nEtages mul {}for ]
33 [nMeridiens nEtages mul 1 nMeridiens nEtages 1 add mul 1 sub {}for ]
34 },plansepare= {[1 0 0 -1.5]},name=coupeHyperboloidTest,action=none]
35 % file=hyperboloideVersion2,
36 % action=writesolid]
37 %\psSolid[object=datfile,
38 % file=hyperboloideVersion2, fillcolor=red!50,incolor=yellow, linewidth=0.5\pslinewidth
39 % ]
40 \psSolid[object=load,incolor=yellow!50,fillcolor=ForestGreen!20, fcol=0 (JaunePale) 1 (JaunePale),% 1078 (JaunePale),
41 linewidth=0.5\pslinewidth, % numfaces=all,
42 intersectionplan={ [1 0 0 -1.5] },intersectioncolor=(bleu),intersectionlinewidth=2,
43 intersectiontype=0,load=coupeHyperboloidTest1,hollow=false]
44 \psSolid[object=plan,definition=equation,args={ [1 0 0 -1.5] 90 },linecolor=red,
45 fillcolor=Aquamarine,planmarks,base=-3 3 -3 3,showBase,action=draw]
46 \gridIIID[Zmin=-3,Zmax=3](-3,3)(-3,3)
47 \end{pspicture}

```



Example 8

```

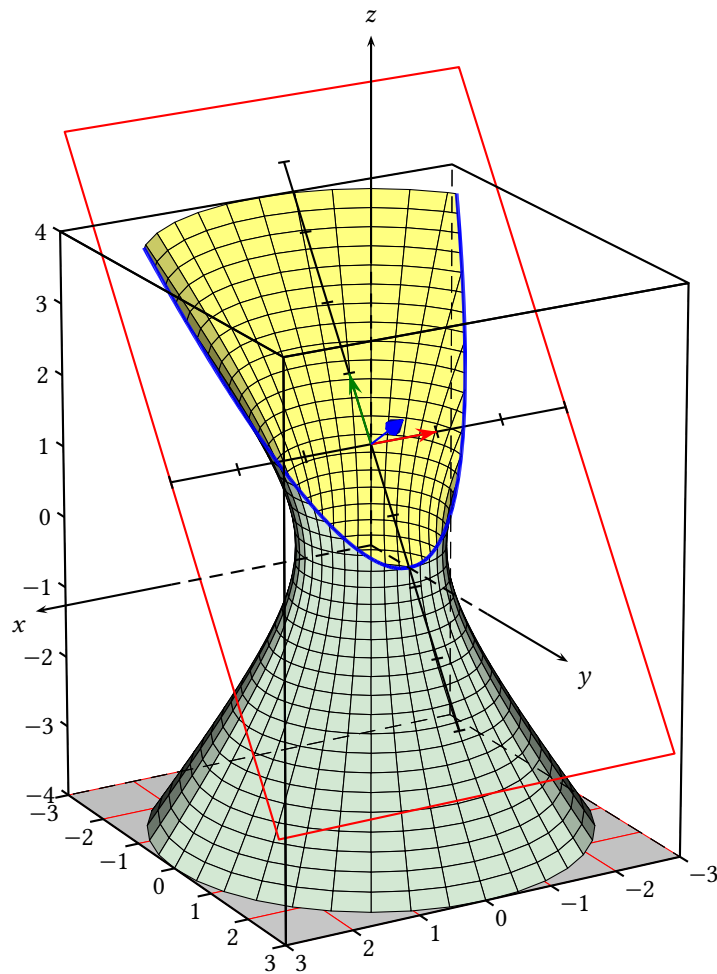
1 \begin{pspicture}(-8,-7)(8,7)
2 \psset{solidmemory,viewpoint=100 60 20 rtp2xyz,lightsrc=viewpoint,Decran=100}
3 \pstVerb{/Hauteur 8 def /nEtages 36 def
4 /Pas 1 nEtages div def /nMeridiens 36 def
5 /DemiAxeFocal 1 def % rayon de l'étranglement au milieu
6 /RayonBases 3 def
7 /DemiAxeNonFocal Hauteur 2 div RayonBases dup mul DemiAxeFocal dup mul sub sqrt div DemiAxeFocal mul def
8 /xMax DemiAxeNonFocal DemiAxeFocal mul DemiAxeNonFocal dup mul DemiAxeFocal dup mul sub sqrt div def
9 /GrandAxe xMax 2 sqrt mul def /ConeAsymptote DemiAxeFocal DemiAxeNonFocal div def
10 }%
11 \psSolid[object=grille,base=-3 3 -3 3,linewidth=0.5\pslinewidth,linecolor=red](0,0,Hauteur 2 div neg)%
12 \psSolid[object=new,fillcolor=red!50,incolor=yellow,%hollow,
13 action=draw*,sommets=
14 0.5 Pas neg -0.5 Pas neg add{
15 /k exch def
16 0 1 nMeridiens 1 sub {
17 /i exch def
18 /r 4 k dup mul RayonBases dup mul DemiAxeFocal dup mul sub mul DemiAxeFocal dup mul add sqrt def
19 360 nMeridiens idiv i mul cos r mul
20 360 nMeridiens idiv i mul sin r mul
21 k Hauteur mul
22 } for
23 } for, faces={
24 0 1 nEtages 1 sub {
25 /k1 exch def
26 k1 nMeridiens mul 1 add 1 k1 1 add nMeridiens mul 1 sub {
27 /i exch def

```

```

28 [i i 1 sub nMeridiens i add 1 sub nMeridiens i add]
29 } for
30 [k1 nMeridiens mul k1 1 add nMeridiens mul 1 sub k1 2 add nMeridiens mul 1 sub k1 1 add nMeridiens mul]
31 } for
32 % faces du dessus et de dessous
33 %[0 1 nMeridiens 1 sub {}for]
34 %[nMeridiens nEtages 1 add mul 1 sub -1 nMeridiens nEtages mul {}for ]
35 }, plansepare={[0 1 ConeAsymptote 0]},name=coupeHyperboloidTest,action=none]
36 \psSolid[object=load,incolor=yellow!50,fillcolor=ForestGreen!20, linewidth=0.5\pslinewidth,
37 rm=0,% intersectionplan={[0 1 ConeAsymptote 0]}, intersectioncolor=(bleu),
38 % intersectionlinewidth=2,intersectiontype=0,
39 load=coupeHyperboloidTest1,hollow=true](0,0,0)
40 \defFunction[algebraic]{ellipse}(t){DemiAxeFocal*cos(t)}{GrandAxe*sin(t)}{}}
41 \psSolid[object=plan,definition=equation,args={[0 1 ConeAsymptote 0] 180},linecolor=red,
42 fillcolor=Aquamarine,planmarks,base=-3 3 -4.9 4.9,showBase,action=draw]%
43 \psSolid[object=plan, definition=equation,args={[0 1 ConeAsymptote 0] 180},base=-5 5 -4.9 4.9,
44 action=none,name=monplan]%
45 \psProjection[object=droite,plan=monplan,linewidth=3\pslinewidth,linecolor=red,args=1 5 1 -5]
46 \psProjection[object=droite,linewidth=3\pslinewidth,plan=monplan,linecolor=red,args=-1 5 -1 -5]
47 \composeSolid
48 %\psPoint(0,DemiAxeFocal,0){F}\psdot(F)
49 %\psPoint(xMax neg,0,xMax){F2}\psdot[linecolor=red](F2)
50 \gridIIID[Zmin=-4,Zmax=4,linewidth=1\pslinewidth](-3,3)(-3,3)
51 \end{pspicture}

```



Example 9

```

1 \begin{pspicture}(-8,-7)(8,7)
2 \psset{solidmemory}
3 \psset{viewpoint=100 60 20 rtp2xyz,lightsrc=viewpoint,Decran=100}
4 \pstVerb{
5   /Hauteur 8 def /nEtages 36 def /Pas 1 nEtages div def /nMeridiens 36 def
6   /DemiAxeFocal 1 def % rayon de l'étrangement au milieu
7   /RayonBases 3 def
8   /DemiAxeNonFocal Hauteur 2 div RayonBases dup mul DemiAxeFocal dup mul sub sqrt div DemiAxeFocal mul def
9   /xMax DemiAxeNonFocal DemiAxeFocal mul DemiAxeNonFocal dup mul DemiAxeFocal dup mul sub sqrt div def
10  /GrandAxe xMax 2 sqrt mul def /ConeAsymptote DemiAxeFocal DemiAxeNonFocal div def
11 }%
12 \psSolid[object=grille,base=-3 3 -3 3,linewidth=0.5\pslinewidth,linecolor=red](0,0,Hauteur 2 div neg)%
13 \psSolid[object=new,fillcolor=red!50,incolor=yellow,%hollow,
14   action=draw*, sommets=
15   0.5 Pas neg -0.5 Pas neg add{
16   /k exch def
17   0 1 nMeridiens 1 sub {
18     /i exch def
19     /r 4 k dup mul mul RayonBases dup mul DemiAxeFocal dup mul sub mul DemiAxeFocal dup mul add sqrt def
20     360 nMeridiens idiv i mul cos r mul
21     360 nMeridiens idiv i mul sin r mul
22     k Hauteur mul
23   } for
24   } for,
25   faces={
26     0 1 nEtages 1 sub {
27       /k1 exch def

```

```

28     k1 nMeridiens mul 1 add 1 k1 1 add nMeridiens mul 1 sub {
29         /i exch def
30         [i i 1 sub nMeridiens i add 1 sub nMeridiens i add]
31     } for
32     [k1 nMeridiens mul k1 1 add nMeridiens mul 1 sub k1 2 add nMeridiens mul 1 sub k1 1 add nMeridiens mul]
33 } for
34 % faces du dessus et de dessous
35 %[0 1 nMeridiens 1 sub {}for]
36 %[nMeridiens nEtages 1 add mul 1 sub -1 nMeridiens nEtages mul {}for ]
37 },
38 plansepare={[0 1 ConeAsymptote -1]}, name=coupeHyperboloidTest, action=none]
39 \psSolid[object=load, incolor=yellow!50, fillcolor=ForestGreen!20, linewidth=0.5\pslinewidth,
40     rm=0, load=coupeHyperboloidTest1,hollow=true](0,0,0)
41 \defFunction[algebraic]{parabole1}(t)
42     {DemiAxeFocal*sqrt(1+(t/DemiAxeNonFocal)^2-((1-ConeAsymptote*t)/DemiAxeFocal)^2)}{1-ConeAsymptote*t}{t}
43 \defFunction[algebraic]{parabole2}(t)
44     {-DemiAxeFocal*sqrt(1+(t/DemiAxeNonFocal)^2-((1-ConeAsymptote*t)/DemiAxeFocal)^2)}{1-ConeAsymptote*t}{t}
45 \psSolid[object=plan, definition=equation, args={[0 1 ConeAsymptote -1] 180},
46     linecolor=red, fillcolor=Aquamarine, planmarks, base=-3 3 -4.9 4.9, showBase,action=draw
47 ]%
48 \psSolid[object=courbe, r=0, range=0 4, linecolor=blue,linewidth=0.05, resolution=360, function=parabole1]%
49 \psSolid[object=courbe, r=0, range=0 4, linecolor=blue,linewidth=0.05, resolution=360, function=parabole2]%
50 %\psPoint(0,DemiAxeFocal,0){F}\psdot(F)
51 %\psPoint(xMax neg,0,xMax){F2}\psdot[linecolor=red](F2)
52 \gridIID[Zmin=-4,Zmax=4,linewidth=1\pslinewidth](-3,3)(-3,3)
53 \end{pspicture}

```

4 Sections of a Hyperboloid of One Sheet

In this part the mesh of the hyperboloid is defined as a ruled surface. A dedicated macro is used to draw the hyperboloid: `\psHyperboloid Options (x,y,z)`. The available options, along with their default values, are listed below:

R=4 : base radius;

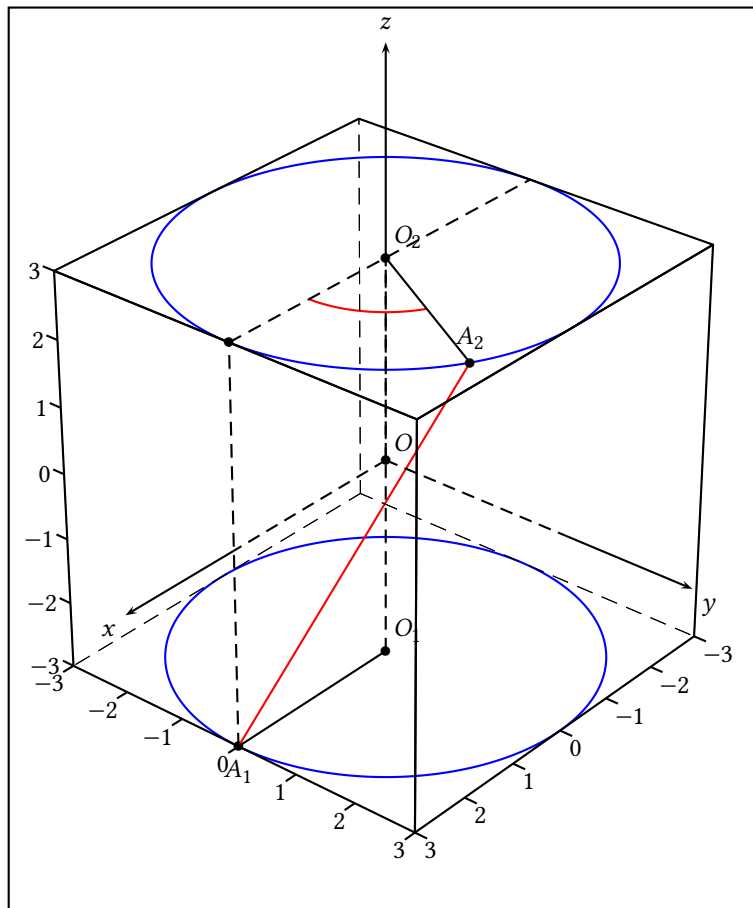
h=8 : height;

ngrid=36 20 : defines the mesh—specifically, the number of lines and the number of circles;

base=0 360 0 1 : specifies the range of rotation around the axis (from 0° to 360°) and the height variation (from $k \times 0.5H$, where $0 < k < 1$);

AngleTorsion=150 : the angular offset between the endpoints of the generating line.

We consider the generating line A_1A_2 , defined by the cylinder's height H , its radius R , and the angular offset θ between its two endpoints.



The geometry of a hyperboloid

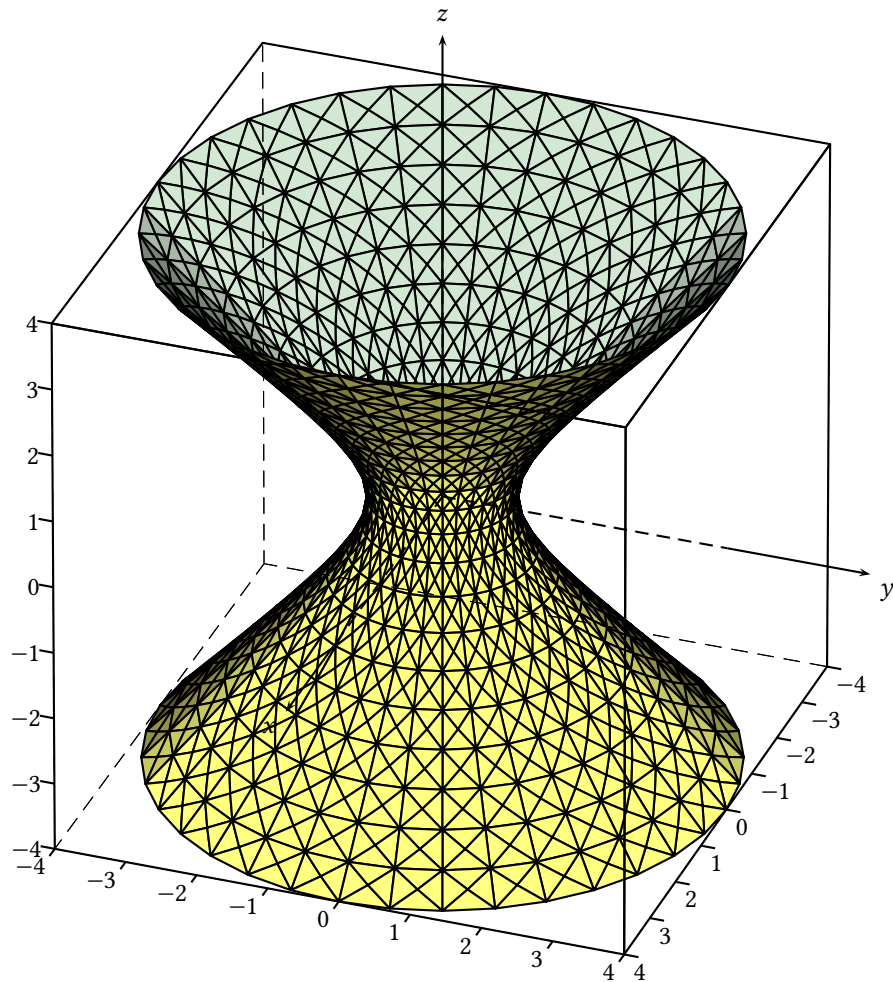
```

1 \begin{pspicture}(-8,-6)(8,6)
2 \psset{solidmemory,viewpoint=50 40 30 rtp2xyz,lightsrc=viewpoint,Decran=50}
3 \psframe(-5,-6)(5,6)
4 \pstVerb{/decalage 60 def /H 6 def /Rayon 3 def}%
5 \psSolid[object=plan,definition=equation,args={[0 0 1 H neg 2 div]}],action=none,name=planH]
6 \psset{plan=planH}
7 \psProjection[object=cercle,resolution=360,args=0 0 Rayon,linecolor=blue,range=0 360]
8 \psProjection[object=cercle,resolution=360,args=0 0 Rayon 2 div,linecolor=red,range=0 decalage]
9 \psSolid[object=plan,definition=equation,args={[0 0 1 H 2 div]}],action=none,name=plan0]
10 \psset{plan=plan0}
11 \psProjection[object=cercle,resolution=360,args=0 0 Rayon,linecolor=blue,range=0 360]
12 \psProjection[object=texte,fontsize=20,linecolor=red,PSfont=Symbol,pos=cc,plan=planH,text=q,phi=120](2,1)%
13 \psPoint(Rayon,0,H 2 div neg){A1}\psdot(A1) \psPoint(Rayon,0,H 2 div){A'1}\psdot(A'1)
14 \psPoint(0,0,0){O}\psdot(O)
15 \psLineIIID[linestyle=dashed](Rayon,0,H 2 div)(Rayon neg,0,H 2 div)
16 \psPoint(0,0,H 2 div neg){O1}\psPoint(0,0,H 2 div){O2}
17 \psPoint(Rayon decalage cos mul,Rayon decalage sin mul,H 2 div){A2}
18 \psline[linecolor=red](A1)(A2)\psdots(O1)(O2)(A2)\psline(O2)(A2)
19 \psline[linestyle=dashed](A1)(A'1) \psline[linestyle=dashed](O1)(O2) \psline(O1)(A1)
20 \uput[d](A1){$A_{-1}$} \uput[u](A2){$A_{-2}$} \uput[ur](O2){$O_{-2}$} \uput[ur](O1){$O_{-1}$} \uput[ur](O){$O$}
21 \gridIIID[Zmin=-3,Zmax=3](-3,3)(-3,3)
22 \end{pspicture}

```

From this, we derive the parametric equations of the hyperboloid:

$$\begin{cases} x = R((1-k)\cos(t) + k\cos(t+\theta)) \\ y = R((1-k)\sin(t) + k\sin(t+\theta)) \\ z = (k - \frac{1}{2})H \end{cases}$$

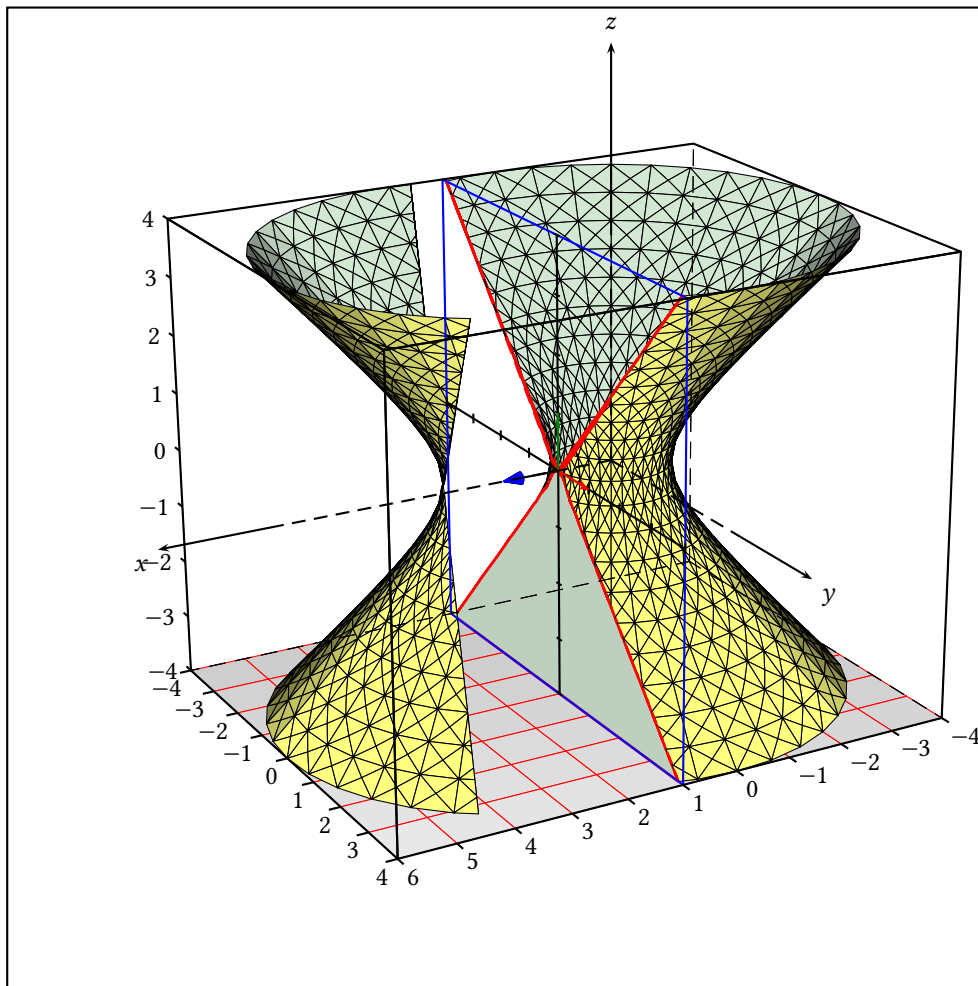


Simple Hyperboloid

```

1 \begin{pspicture}(-8,-7)(8,7)
2 \psset{solidmemory,viewpoint=500 20 30 rtp2xyz,lightsrc=viewpoint,Decran=500}
3 \psHyperboloid[hollow,incolor=yellow!50,fillcolor=ForestGreen!20]
4 \gridIIID[Zmin=-4,Zmax=4](-4,4)(-4,4)
5 \end{pspicture}

```

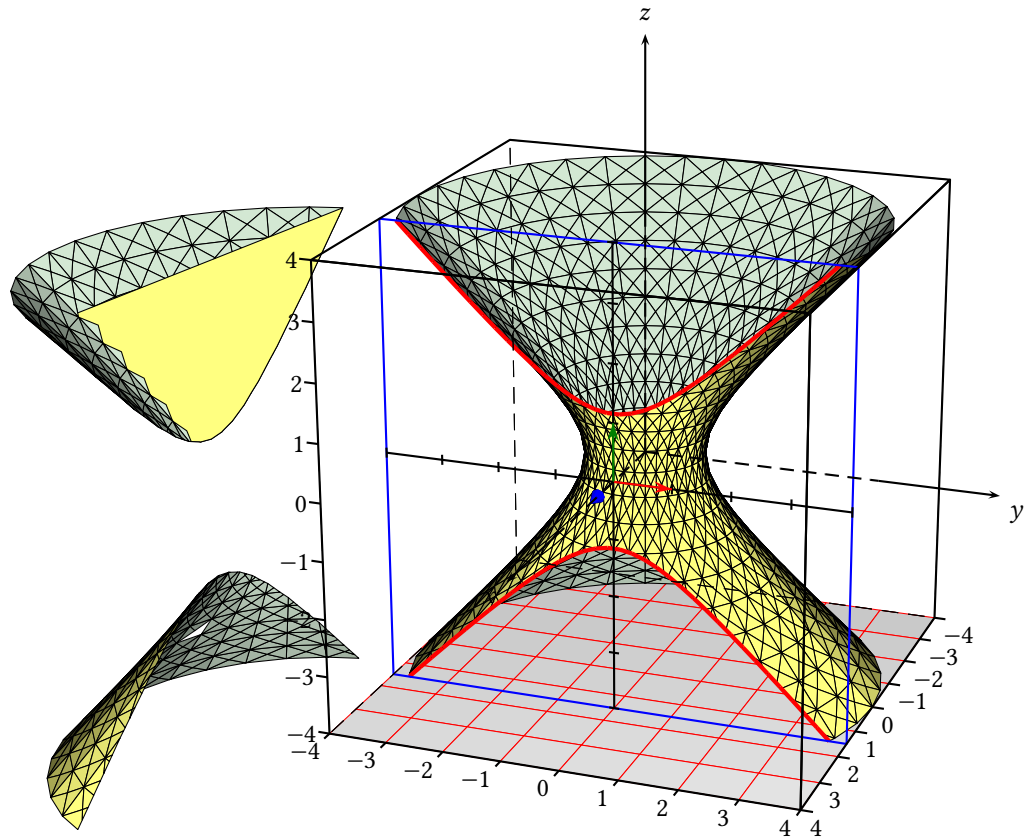


Triangles

```

1 \begin{pspicture}(-8,-7)(5,6)
2 \psframe(-8,-7)(5,6)
3 \psset{solidmemory,viewpoint=50 60 20 rtp2xyz,lightsrc=viewpoint,Decran=40}
4 \pstVerb{/X0 0.5 def}%
5 \psSolid[object=grille,base=-4 6 -4 4,ngrid=10 8,linewidth=0.5\pslinewidth,linecolor=red](0,0,-4)%
6 \psHyperboloid[hollow,R=4,incolor=yellow!50,fillcolor=ForestGreen!20,
7   plansepare={[1 0 0 DemiAxeFocal neg]},name=coupeHyperboloidTest,action=none]
8 \psSolid[object=load,incolor=yellow!50,fillcolor=ForestGreen!20,linewidth=0.5\pslinewidth,
9   rm=0,intersectionplan={[1 0 0 DemiAxeFocal neg]},intersectioncolor=(rouge),
10  intersectionlinewidth=1,intersectiontype=0,load=coupeHyperboloidTest1]
11 \psSolid[object=load,incolor=yellow!50,fillcolor=ForestGreen!20,linewidth=0.5\pslinewidth,% rm=0 1 253,
12   RotZ=-20,load=coupeHyperboloidTest0](2,0,0)
13 \psSolid[object=plan,definition=equation,
14   args={[1 0 0 DemiAxeFocal neg] 90},linecolor=blue,% fillcolor=Aquamarine,
15   planmarks,base=-4 4 -4 4,showBase,action=draw]
16 \gridIIID[Zmin=-4,Zmax=4](-4,6)(-4,4)
17 \end{pspicture}

```

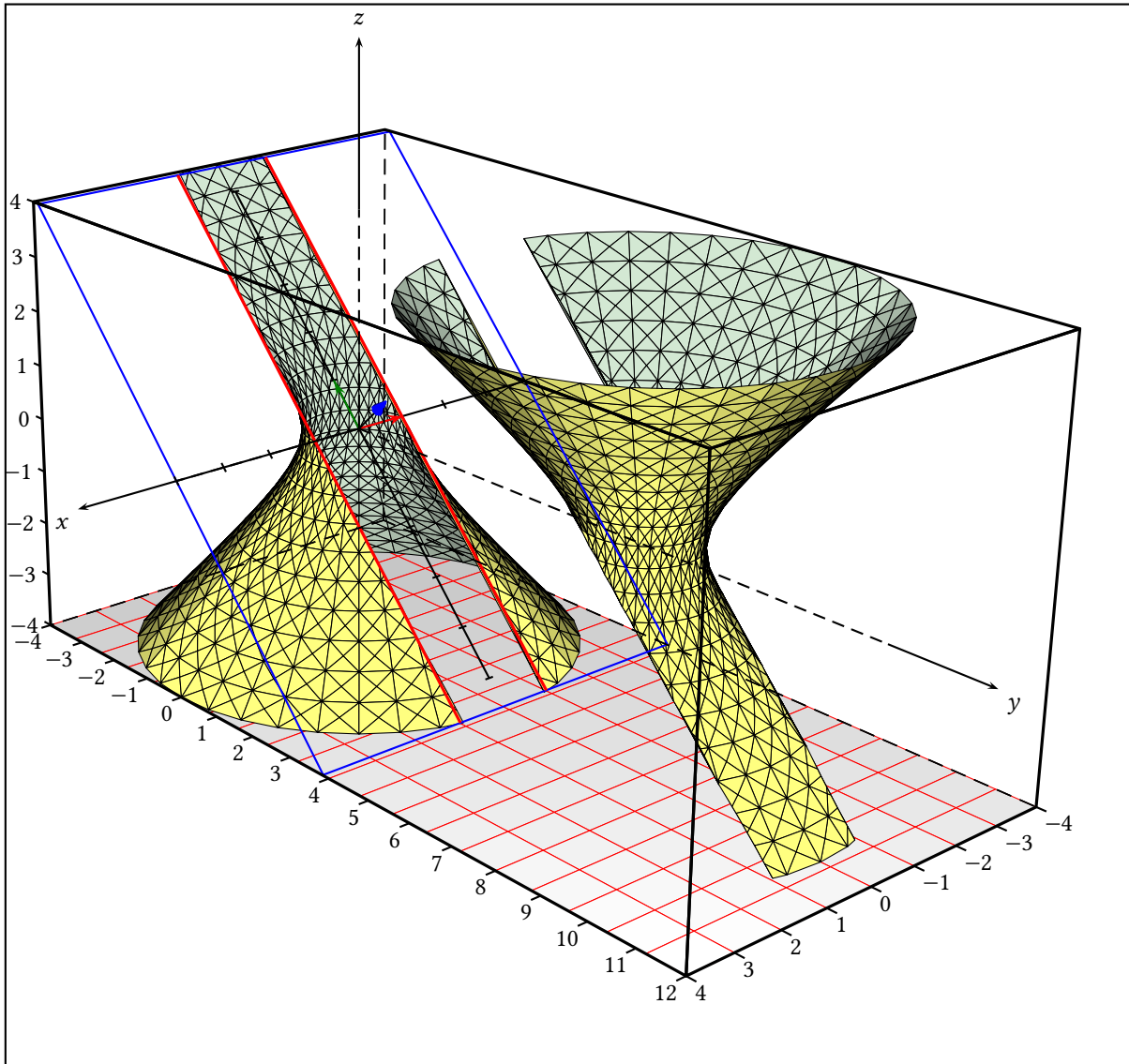


Parabolas

```

1 \begin{pspicture}(-8,-7)(8,7)
2 \psset{solidmemory,viewpoint=50 20 20 rtp2xyz,lightsrc=viewpoint,Decran=40}
3 \pstVerb{/X0 1.5 def}%
4 \psSolid[object=grille,base=-4 4 -4 4,ngrid=8 8,linewidth=0.5\pslinewidth,linecolor=red](0,0,-4)%
5 \psHyperboloid[hollow,incolor=yellow!50,fillcolor=ForestGreen!20,plansepare={1 0 0 X0 neg}],
6   name=coupeHyperboloidTest,action=none]
7 \psSolid[object=load,incolor=yellow!50,fillcolor=ForestGreen!20,linewidth=0.5\pslinewidth,
8   rm=0 1,load=coupeHyperboloidTest1]
9 \defFunction[algebraic]{hyperbol1}(t){X0}{t}{sqrt(((X0^2+t^2)/(DemiAxeFocal^2)-1))*DemiAxeNonFocal}
10 \defFunction[algebraic]{hyperbol2}(t){X0}{t}{-sqrt(((X0^2+t^2)/(DemiAxeFocal^2)-1))*DemiAxeNonFocal}
11 \psSolid[object=courbe,linewidth=2\pslinewidth,function=hyperbol1,range=Ymax neg Ymax,r=0,linecolor=red]%
12 \psSolid[object=courbe,linewidth=2\pslinewidth,function=hyperbol2,range=Ymax neg Ymax,r=0,linecolor=red]%
13 \psSolid[object=load,incolor=yellow!50,linewidth=0.5\pslinewidth,fillcolor=ForestGreen!20,
14   rm=0 1 178 179,load=coupeHyperboloidTest0,RotZ=-100](5,-4,0)
15 \psSolid[object=plan,definition=equation,args={1 0 0 -1.5} 90],linecolor=blue,planmarks,
16   base=-4 4 -4 4,ngrid={},showBase,action=draw]
17 \gridIIID[Zmin=-4,Zmax=4](-4,4)(-4,4)
18 \end{pspicture}

```

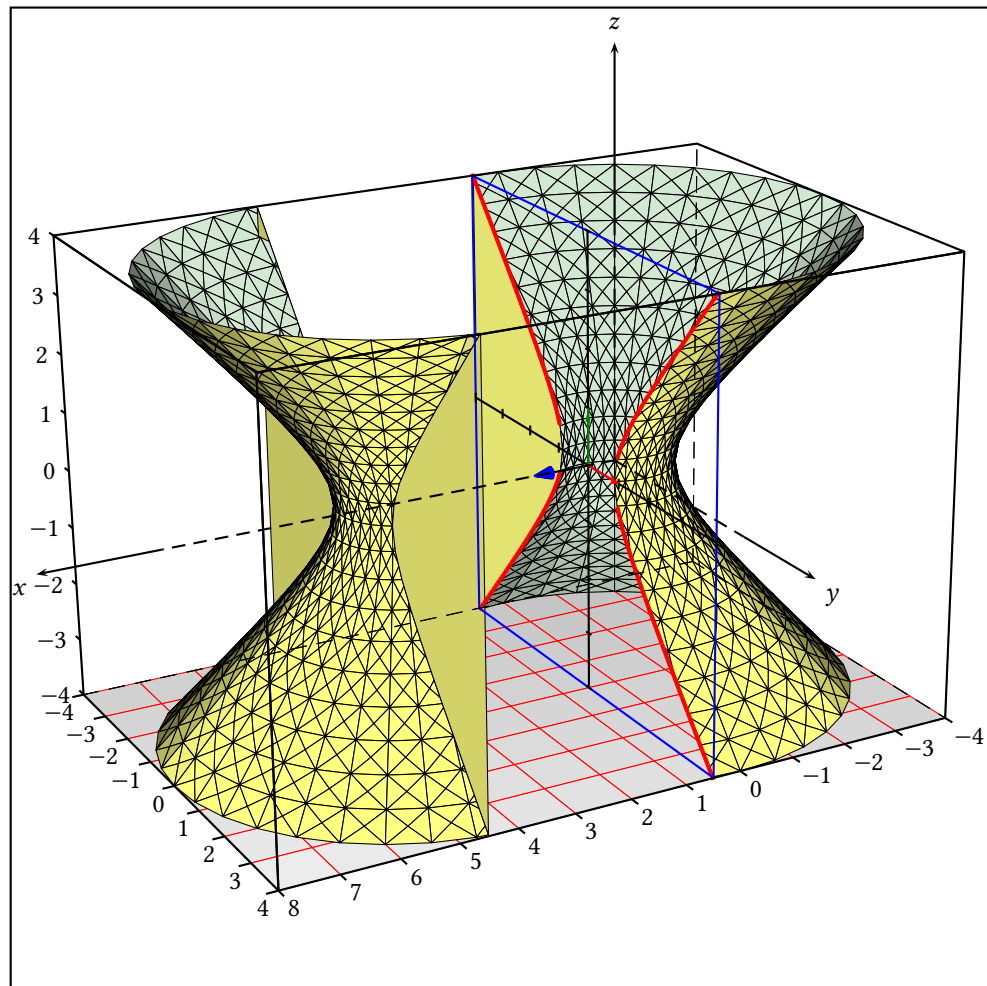


Parallel Lines

```

1 \begin{pspicture}(-5,-9)(11,6)
2 \psframe(-5,-9)(11,6)
3 \psset{solidmemory,viewpoint=50 50 20 rtp2xyz,lightsrc=viewpoint,Decran=40}
4 \pstVerb{/X0 1.5 def}%
5 \psSolid[object=grille,base=-4 4 -4 12,ngrid=8 20,linewidth=0.5\pslinewidth,linecolor=red](0,0,-4)%
6 \psHyperboloid[hollow,incolor=yellow!50,fillcolor=ForestGreen!20,plansepare={[0 1 ConeAsymptote 0]},
7   name=coupeHyperboloidTest,action=none]
8 \psSolid[object=load,incolor=yellow!50,fillcolor=ForestGreen!20,linewidth=0.5\pslinewidth,
9   rm=0 1,load=coupeHyperboloidTest1]
10 \psSolid[object=load,incolor=yellow!50,linewidth=0.5\pslinewidth,fillcolor=ForestGreen!20,% rm=0 1 178 179,
11   load=coupeHyperboloidTest0](0,7,0)
12 \psSolid[object=plan,definition=equation,args={[0 1 ConeAsymptote 0] 180},linecolor=blue,
13   planmarks,ngrid=,base=-4 4 -5.55 5.55,showBase,action=draw]
14 \psSolid[object=plan,definition=equation,args={[0 1 ConeAsymptote 0] 180},base=-5.5 5.5 -5.55 5.55,
15   action=none,name=monplan]%
16 \psProjection[object=droite,plan=monplan,linewidth=1.5\pslinewidth,linecolor=red,args=1 5 1 -5]
17 \psProjection[object=droite,linewidth=1.5\pslinewidth,plan=monplan,linecolor=red,args=-1 5 -1 -5]
18 \composeSolid
19 \gridIIDD[Zmin=-4,Zmax=4](-4,4)(-4,12)
20 \end{pspicture}

```

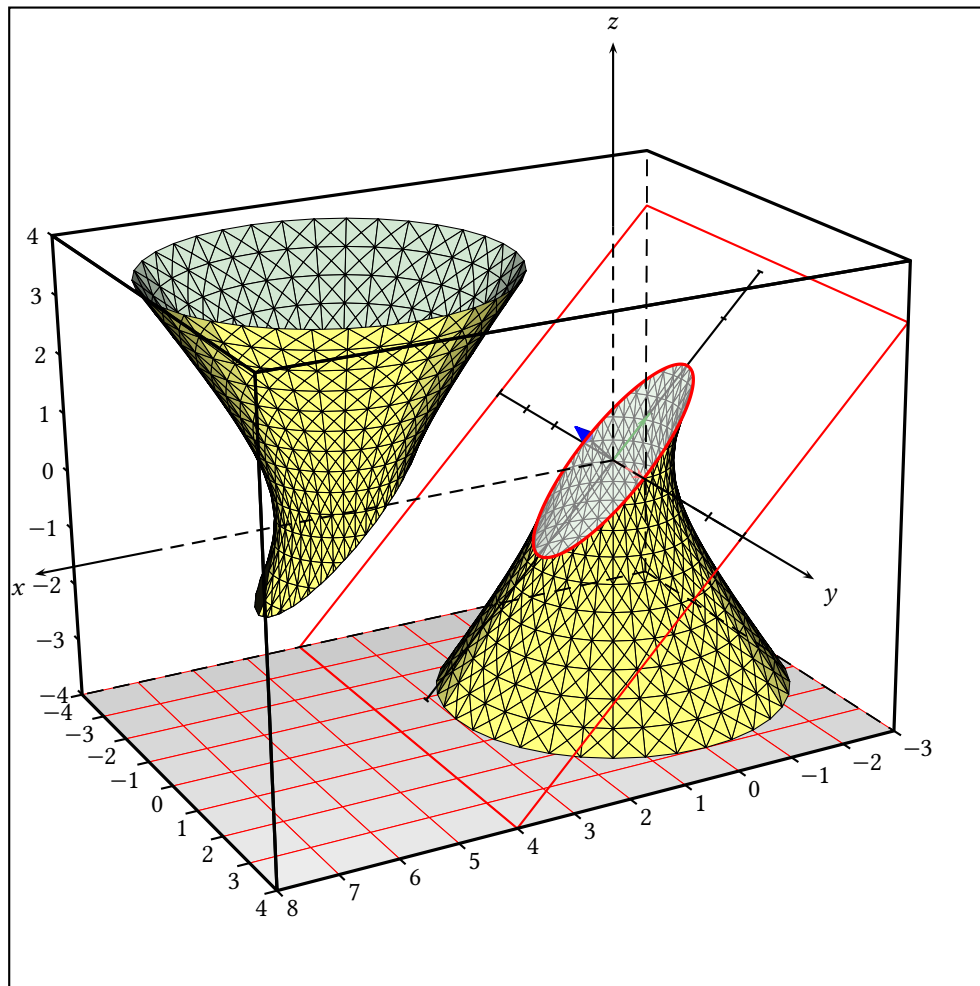


The Hyperbole

```

1 \begin{pspicture}(-8,-7)(5,6)
2 \psframe(-8,-7)(5,6)
3 \psset{solidmemory,viewpoint=50 60 20 rtp2xyz,lightsrc=viewpoint,Decran=40}
4 \pstVerb{/X0 0.5 def}%
5 \psSolid[object=grille,base=-4 8 -4 4,ngrid=12 8,linewidth=0.5\pslinewidth,linecolor=red](0,0,-4)%
6 \psHyperboloid[hollow,incolor=yellow!50,fillcolor=ForestGreen!20,plansepare={[1 0 0 X0 neg]}],
7   name=coupeHyperboloidTest,action=none]
8 \psSolid[object=load,incolor=yellow!50,fillcolor=ForestGreen!20,linewidth=0.5\pslinewidth,
9   rm=0 1,load=coupeHyperboloidTest1]
10 \psSolid[object=load,incolor=yellow!50,fillcolor=ForestGreen!20, linewidth=0.5\pslinewidth,
11   rm=0 1 333,load=coupeHyperboloidTest0](4,0,0)
12 \defFunction[algebraic]{hyperbol3}(t){X0}{t}{DemiAxeNonFocal*sqrt((t^2+X0^2)/(DemiAxeFocal^2)-1)}
13 \defFunction[algebraic]{hyperbol4}(t){X0}{t}{-DemiAxeNonFocal*sqrt((t^2+X0^2)/(DemiAxeFocal^2)-1)}
14 \psSolid[object=courbe,linewidth=2\pslinewidth,function=hyperbol3,range=Y0 neg -4,r=0,linecolor=red]%
15 \psSolid[object=courbe,linewidth=2\pslinewidth,function=hyperbol3,range=Y0 4,r=0,linecolor=red]%
16 \psSolid[object=courbe,linewidth=2\pslinewidth,function=hyperbol4,range=Y0 4,r=0,linecolor=red]%
17 \psSolid[object=courbe,linewidth=2\pslinewidth,function=hyperbol4,range=Y0 neg -4, r=0,linecolor=red]%
18 \psSolid[object=plan,definition=equation,args={[1 0 0 -0.5] 90},linecolor=blue,planmarks,
19   ngrid=,base=-4 4 -4 4,showBase,action=draw]
20 \gridIIDD[Zmin=-4,Zmax=4](-4,8)(-4,4)
21 \end{pspicture}

```

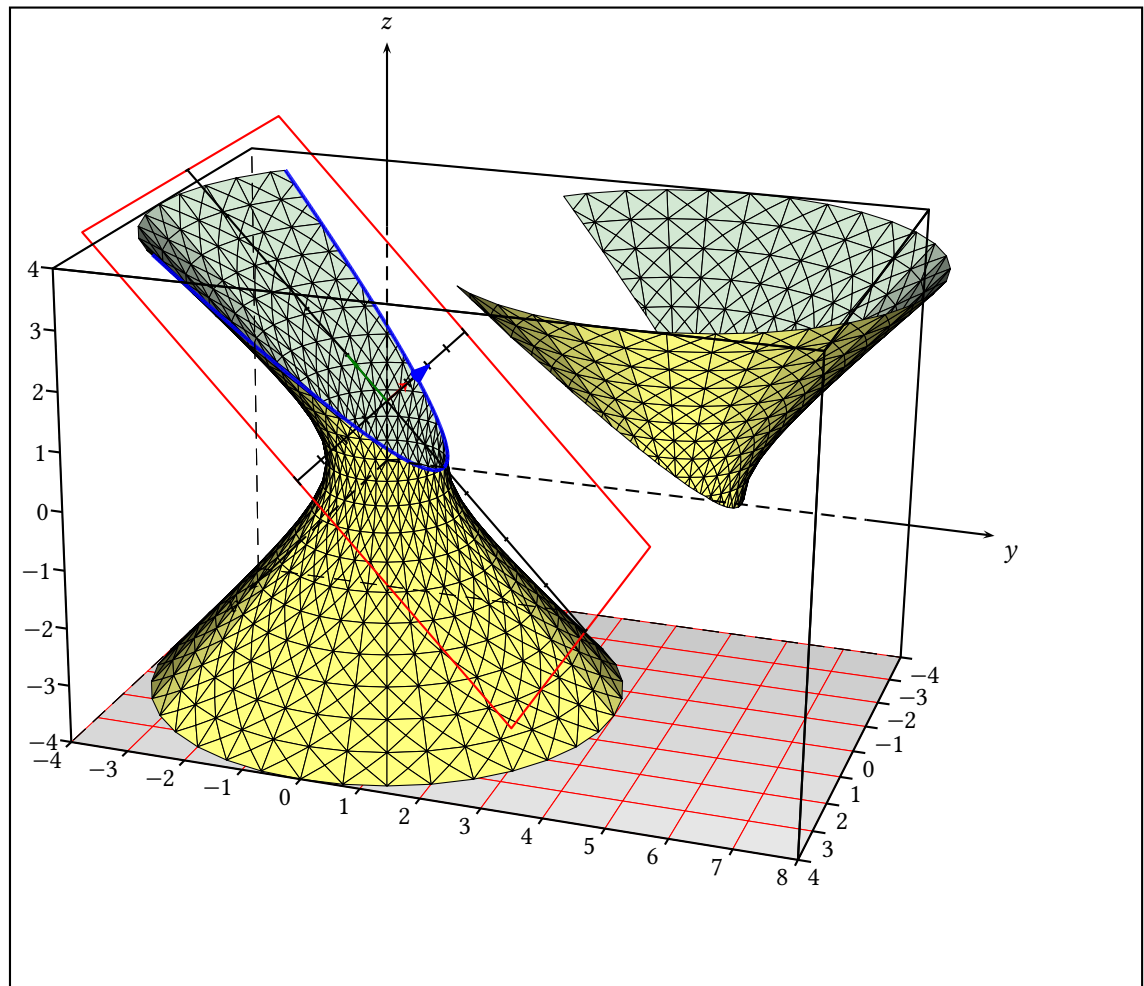



The Ellipse

```

1 \begin{pspicture}(-8,-7)(5,6)
2 \psframe(-8,-7)(5,6)
3 \psset{solidmemory,viewpoint=50 60 20 rtp2xyz,lightsrc=viewpoint,Decran=40}
4 \pstVerb{/X0 0.5 def}%
5 \psSolid[object=grille,base=-3 8 -4 4,ngrid=11 8,linewidth=0.5\pslinewidth,linecolor=red](0,0,-4)%
6 \psHyperboloid[hollow,R=3,incolor=yellow!50,fillcolor=ForestGreen!20,
7   plansepare={[1 0 1 0]},name=coupeHyperboloidTest,action=none]
8 \psSolid[object=load,incolor=yellow!50,fillcolor=ForestGreen!20,linewidth=0.5\pslinewidth,rm=0,
9   % 1,
10  load=coupeHyperboloidTest1]
11 \psSolid[object=load,incolor=yellow!50,fillcolor=ForestGreen!20,linewidth=0.5\pslinewidth,%rm=0 1,
12  load=coupeHyperboloidTest0](5,0,0)
13 \defFunction[algebraic]{ellipse}(t){DemiAxeFocal*cos(t)}{GrandAxe*sin(t)}{}
14 \psSolid[object=plan,definition=equation,args={[1 0 1 0] 90},linecolor=red,planmarks,
15   base=-4 4 -4 2 sqrt mul 3 2 sqrt mul,showBase,action=draw]%
16 \defFunction[algebraic]{ellipse}(t){DemiAxeFocal*cos(t)}{GrandAxe*sin(t)}{}
17 \psSolid[object=plan,definition=equation,args={[1 0 1 0] 90},base=-10 10 -10 10,action=none,
18   name=monplan]%
19 \psProjection[object=courbeR2,plan=monplan,range=0 2 pi mul,resolution=360,linecolor=red,
20   fillstyle=solid,opacity=0.5,linewidth=1.5\pslinewidth,function=ellipse]%
21 \composeSolid
22 \gridIIDD[Zmin=-4,Zmax=4](-3,8)(-4,4)
23 \end{pspicture}

```



The Parabola

```

1 \begin{pspicture}(-5,-7)(10,6)
2 \psframe(-5,-7)(10,6)
3 \psset{solidmemory}
4 \psset{viewpoint=50 20 20 rtp2xyz,lightsrc=viewpoint,Decran=40}
5 \pstVerb{/X0 0.5 def}%
6 \psSolid[object=grille,base=-4 4 -4 8,ngrid=8 12,linewidth=0.5\pslinewidth,linestyle=red](0,0,-4)%
7 \psHyperboloid[hollow,R=4,incolor=yellow!50,fillcolor=ForestGreen!20,plansepare={[0 1 ConeAsymptote -1]},
8   name=coupeHyperboloidTest,action=none]
9 \psSolid[object=load,incolor=yellow!50,fillcolor=ForestGreen!20,linewidth=0.5\pslinewidth,
10   rm=0,load=coupeHyperboloidTest1]
11 \psSolid[object=load,incolor=yellow!50,fillcolor=ForestGreen!20,linewidth=0.5\pslinewidth,
12   rm=236,load=coupeHyperboloidTest0](0,5,0)
13 \psSolid[object=plan,definition=equation,args={[0 1 ConeAsymptote -1] 180},linecolor=red,
14   planmarks,base=-4 4 -5 5,showBase,action=draw]%
15 \defFunc-
16   ↪ \tione[algebraic]{parabole1}(t){DemiAxeFocal*sqrt(1+(t/DemiAxeNonFocal)^2-((1-ConeAsymptote*t)/DemiAxeFocal)^2)}{1-ConeAsymptote}
17 \defFunc-
18   ↪ \tione[algebraic]{parabole2}(t){-DemiAxeFocal*sqrt(1+(t/DemiAxeNonFocal)^2-((1-ConeAsymptote*t)/DemiAxeFocal)^2)}{1-ConeAsymptote}
19 \psSolid[object=courbe,r=0,range=0 4,linestyle=blue,linewidth=0.05,resolution=360,function=parabole1]%
20 \psSolid[object=courbe,r=0,range=0 4,linestyle=blue,linewidth=0.05,resolution=360,function=parabole2]%
21 \composeSolid
22 \gridIIID[Zmin=-4,Zmax=4](-4,4)(-4,8)
23 \end{pspicture}

```


References

- [1] WIKIPEDIA. *Uniform tilings in hyperbolic plane*. URL: https://en.wikipedia.org/wiki/Uniform_tilings_in_hyperbolic_plane (visited on 05/30/2026).
- [2] David Eppstein. *The Geometry Junkyard. Tilings of Hyperbolic Spaces*. URL: <https://ics.uci.edu/~eppstein/junkyard/hypertile.html> (visited on 05/30/2026).
- [3] Patrick Fradin. *Pavages hyperboliques*. URL: <https://melusine.eu.org/syracuse/texgraph/exemples/hpavages/> (visited on 05/28/2026).
- [4] Frank Mittelbach et al. *The L^AT_EX Graphics Companion*. 2nd ed. Reprint. Heidelberg and Berlin: Lehmanns Media, 2022.

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