```
>
```

Solids of Revolution

```
> restart;
> with(plots);
Warning, the name changecoords has been redefined

[animate, animate3d, animatecurve, changecoords, complexplot, complexplot3d, conformal,
    contourplot, contourplot3d, coordplot, coordplot3d, cylinderplot, densityplot, display, display3d,
    fieldplot, fieldplot3d, gradplot, gradplot3d, implicitplot, implicitplot3d, inequal, listcontplot,
    listcontplot3d, listdensityplot, listplot, listplot3d, loglogplot, logplot, matrixplot, odeplot, pareto,
    pointplot, pointplot3d, polarplot, polygonplot, polygonplot3d, polyhedra_supported,
    polyhedraplot, replot, rootlocus, semilogplot, setoptions, setoptions3d, spacecurve,
    sparsematrixplot, sphereplot, surfdata, textplot, textplot3d, tubeplot]
```

We view the pyramid $z = 10 - (|x| + |y|)$.

```
> implicitplot3d( z=10-(abs(x)+abs(y)),  x = -10..10, y = -10..10, z
  =0..10,   orientation = [-55, 70],
   axes = none, numpoints = 2000, style = patchnogrid,
  lightmodel=light2 );
```

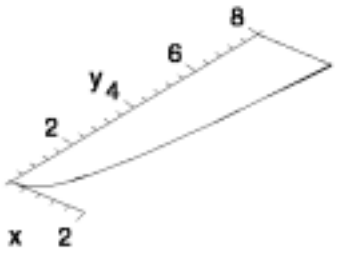
We next view the slice from $z = 4$ to $z = 5$ of the pyramid $z = 10 - (|x| + |y|)$.

```
> p1:=implicitplot3d( x=0 and y=0,  x = -10..10, y = -10..10, z =0..10,
  orientation = [-55, 70],
   axes = none, numpoints = 2000, style = patchnogrid,
  lightmodel=light2 ):
> p2:=implicitplot3d( 10-(abs(x)+abs(y)) = z,  x = -10..10, y =
```

```
   -10..10, z =4..5,   orientation = [-55, 70],
    axes = none, numpoints = 2000, style = patchnogrid,
   lightmodel=light2 ):
> display(p1,p2);
```

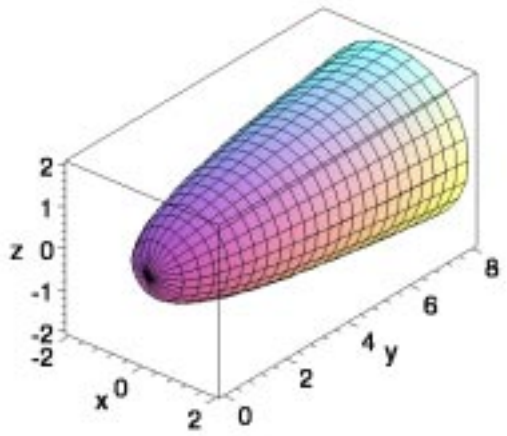
We view the region bounded by $y = x^3$, $y = 0$, and $y = 8$.

```
> p0:=plot3d([x,x^3,z],x=0..2,z=0..0.001*Pi,axes=normal,orientation =
   [-50, 60], scaling=constrained,labels=["x","y",""]):
> p1:=plot3d([x,8,z],x=0..2,z=0..0.001*Pi,axes=normal,orientation =
   [-50, 60], scaling=constrained,labels=["x","y",""]):
> display(p0,p1);
```



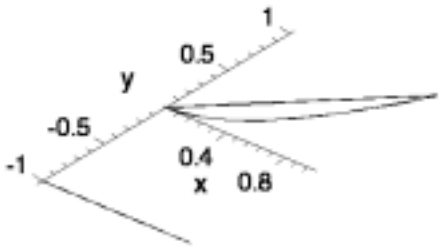
We now view the above region rotated about the y-axis.

```
> plot3d([y^(1/3)*cos(t),y,y^(1/3)*sin(t)],y=0..8,t=0..2*Pi,axes=boxed,
  orientation = [-50, 60], scaling=constrained,labels=["x","y","z"]);
```



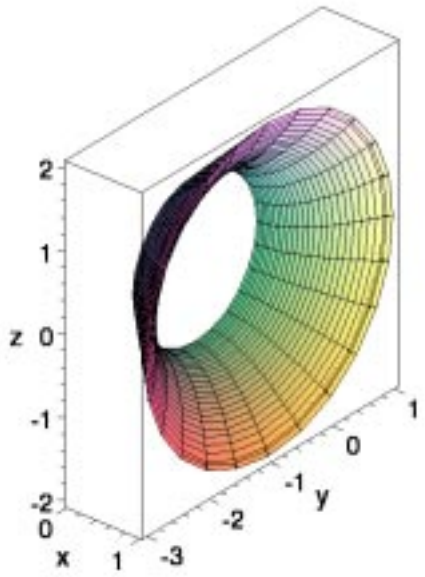
We look at the region enclosed by the curves $y = x$ and $y = x^2$.

```
> p0:=plot3d([x,x,z],x=0..1,z=0..0.001*Pi,axes=normal,orientation =
  [-50, 60], scaling=constrained,labels=["x","y",""]):
> p1:=plot3d([x,x^2,z],x=0..1,z=0..0.001*Pi,axes=normal,orientation =
  [-50, 60], scaling=constrained,labels=["x","y",""]):
> p2:=plot3d([x,-1,z],x=0..1,z=0..0.001*Pi,axes=normal,orientation =
  [-50, 60], scaling=constrained,labels=["x","y",""]):
> display(p0,p1,p2);
```



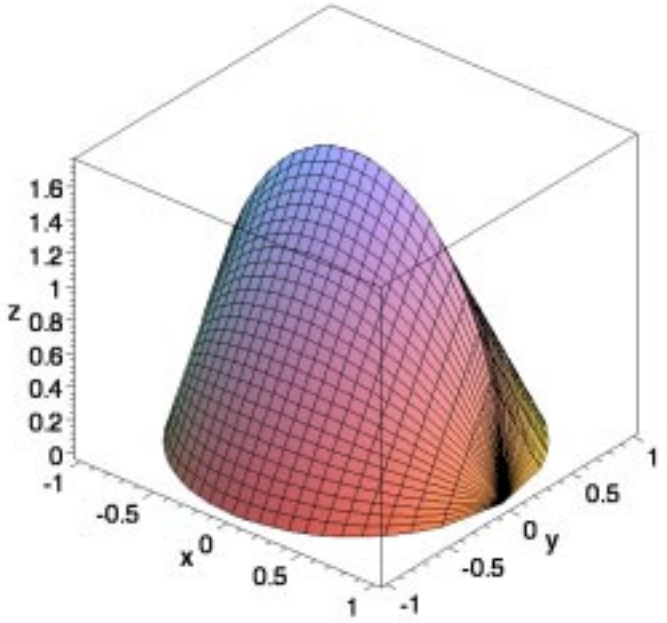
We now rotate the above region about the line $y = -1$.

```
> p0:=plot3d([x,-1+(1+x)*cos(t),(1+x)*sin(t)],x=0..1,t=0..2*Pi,axes=box
  ed,orientation = [-50, 60],
  scaling=constrained,labels=["x","y","z"]):
> p1:=plot3d([x,-1+(1+x^2)*cos(t),(1+x^2)*sin(t)],x=0..1,t=0..2*Pi,axes
  =boxed,orientation = [-50, 60],
  scaling=constrained,labels=["x","y","z"]):
> display(p0,p1);
```



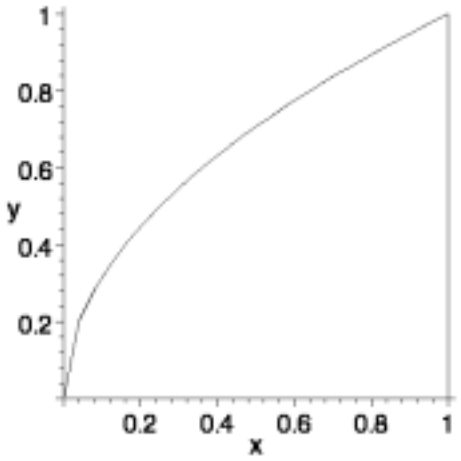
Solid of circular base of radius 1 where cross section perpendicular to the x-axis are equilateral triangles.

```
> p0:=plot3d([x,(1-t)*sqrt(1-x^2),sqrt(3)*t*sqrt(1-x^2)],x=-1..1,t=0..1
  ,axes=boxed,orientation = [-50, 60],
  scaling=constrained,labels=["x","y","z"]):
> p1:=plot3d([x,(-1+t)*sqrt(1-x^2),sqrt(3)*t*sqrt(1-x^2)],x=-1..1,t=0..
  1,axes=boxed,orientation = [-50, 60],
  scaling=constrained,labels=["x","y","z"]):
> display(p0,p1);
```



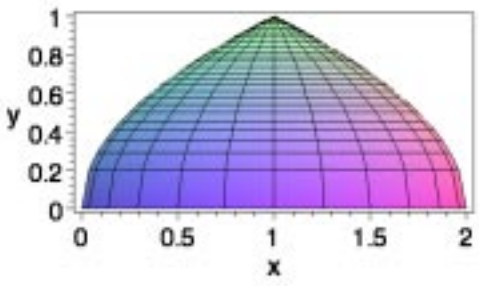
Page 382 # 7: We look at the region enclosed by the curves $y = \sqrt{x}$, $x = 1$, and $y = 0$.

```
> p0:=plot3d([x,sqrt(x),z],x=0..1,z=0..0.001*Pi,axes=normal,orientation
  = [-90, 0], scaling=constrained,labels=["x","y",""]):
> p1:=plot3d([1,y,z],y=0..1,z=0..0.001,axes=normal,orientation = [-90,
  0], scaling=constrained,labels=["x","y",""]):
> display(p0,p1);
```



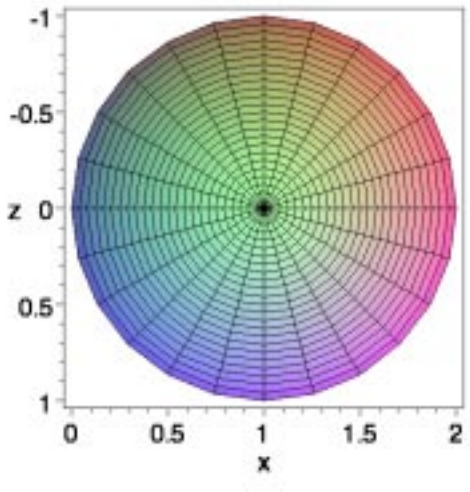
We now rotate the above region about the line $x = 1$. This first view is looking in perpendicular to the x-y plane.

```
> plot3d([1+(1-(x))*cos(t),sqrt(x),(1-(x))*sin(t)],x=0..1,t=0..2*Pi,axe
  s=boxed,orientation = [-90, 0],
  scaling=constrained,labels=["x","y","z"]);
```



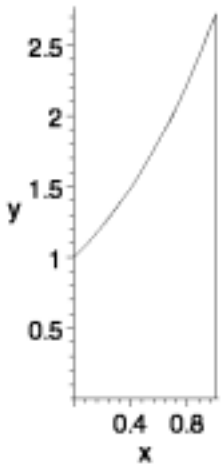
This next view is looking in perpendicular to the x-z plane. Notice the concentric circles.

```
> plot3d([1+(1-(x))*cos(t),sqrt(x),(1-(x))*sin(t)],x=0..1,t=0..2*Pi,axe
  s=boxed,orientation = [-90, -90],
  scaling=constrained,labels=["x","y","z"]);
```



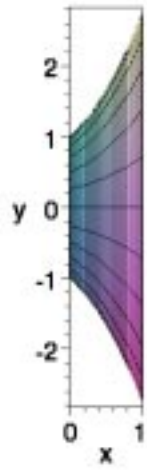
Page 382 # 9: We look at the region enclosed by the curves $y = \mathbf{e}^x$, $x = 0$, $x = 1$, and $y = 0$.

```
> p0:=plot3d([x,exp(x),z],x=0..1,z=0..0.001,axes=normal,orientation =
  [-90, 0], scaling=constrained,labels=["x","y",""]):
> p1:=plot3d([1,y,z],y=0..exp(1),z=0..0.001*Pi,axes=normal,orientation
  = [-90, 0], scaling=constrained,labels=["x","y",""]):
> display(p0,p1);
```



We now rotate the above region about the x-axis. We view perpendicular to the x-y plane.

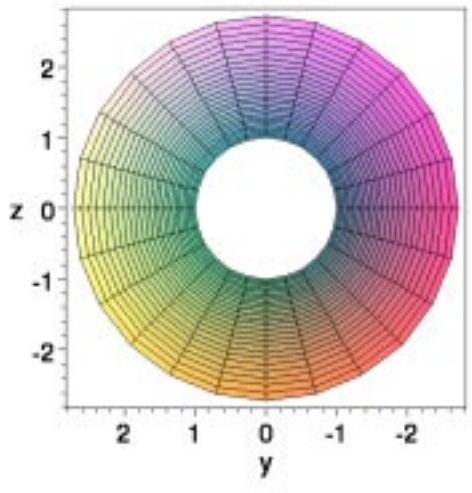
```
> plot3d([x,exp(x)*cos(t),exp(x)*sin(t)],x=0..1,t=0..2*Pi,axes=boxed,or
  ientation = [-90, 0], scaling=constrained,labels=["x","y","z"]);
```



This next view is looking in perpendicular to the x-z plane. Notice the concentric circles.

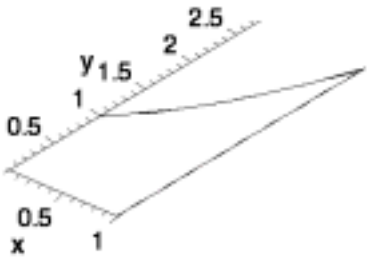
```
> plot3d([x,exp(x)*cos(t),exp(x)*sin(t)],x=0..1,t=0..2*Pi,axes=boxed,or
```

```
ientation = [-180, 90], scaling=constrained,labels=["x","y","z"]);
```



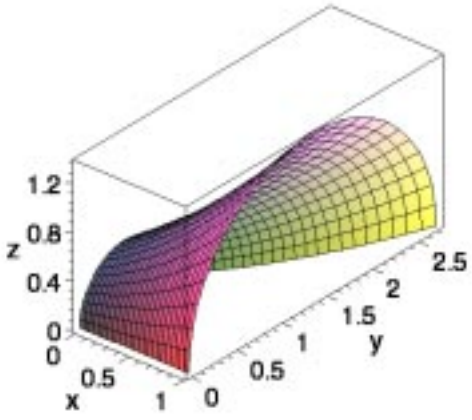
Page 382 # 13: We take another view of the region enclosed by the curves $y = \mathbf{e}^x$, $x = 0$, $x = 1$, and $y = 0$.

```
> p0:=plot3d([x,exp(x),z],x=0..1,z=0..0.001,axes=normal,orientation =
  [-50, 60], scaling=constrained,labels=["x","y",""]):
> p1:=plot3d([1,y,z],y=0..exp(1),z=0..0.001*Pi,axes=normal,orientation
  = [-50, 60], scaling=constrained,labels=["x","y",""]):
> display(p0,p1);
```



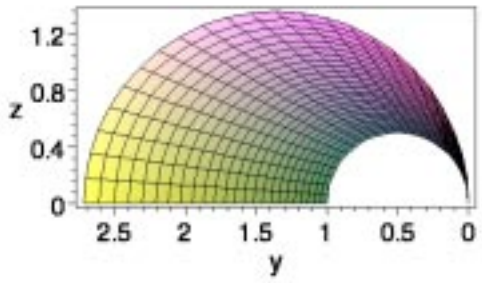
Solid where the base is the region above and whose cross sections perpendicular to the x-axis are semicircles.

```
> plot3d([x,(1+cos(t))*exp(x)/2,sin(t)*exp(x)/2],x=0..1,t=0..Pi,axes=bo
  xed,orientation = [-50, 60],
  scaling=constrained,labels=["x","y","z"]);
```



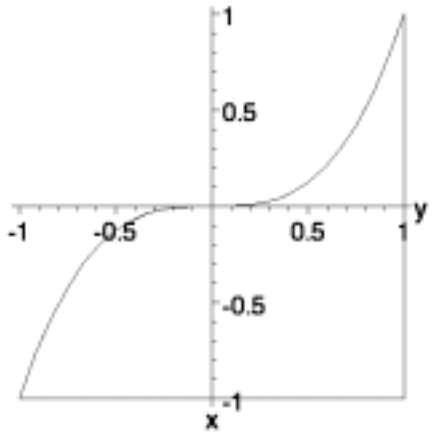
To see the semicircles more clearly, we take a view perpendicular to the y-z plane.

```
> plot3d([x,(1+cos(t))*exp(x)/2,sin(t)*exp(x)/2],x=0..1,t=0..Pi,axes=bo
  xed,orientation = [-180, 90],
  scaling=constrained,labels=["x","y","z"]);
```



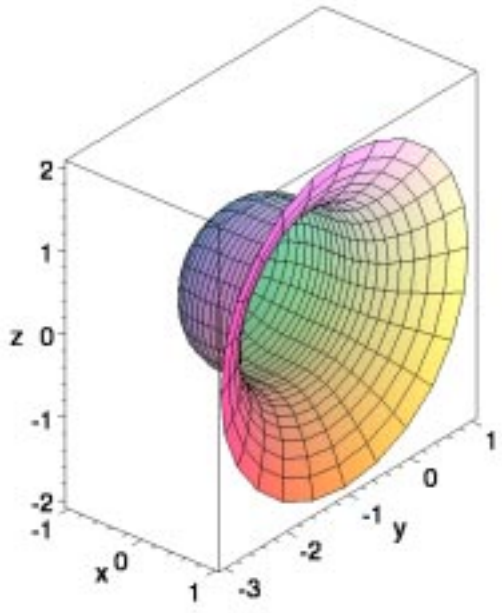
Page 382 # 6: We look at the region enclosed by the curves $y = x^3$, $x = 1$, and $y = -1$.

```
> p0:=plot3d([x,x^3,z],x=-1..1,z=0..0.001,axes=normal,orientation =
  [-90, 0], scaling=constrained,labels=["x","y",""]):
> p1:=plot3d([1,y,z],y=-1..1,z=0..0.001,axes=normal,orientation = [-90,
  0], scaling=constrained,labels=["x","y",""]):
> p2:=plot3d([x,-1,z],x=-1..1,z=0..0.001,axes=normal,orientation =
  [-90, 0], scaling=constrained,labels=["x","y",""]):
> display(p0,p1,p2);
```



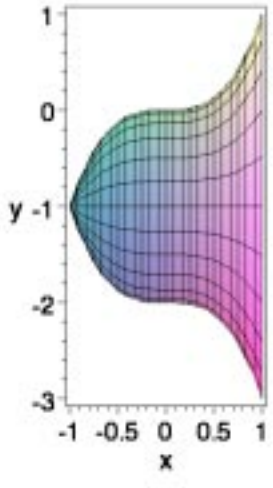
We now rotate the above region about the line $y = -1$.

```
> plot3d([x,-1+(1+x^3)*cos(t),(1+x^3)*sin(t)],x=-1..1,t=0..2*Pi,axes=bo
  xed,orientation = [-50, 60],
  scaling=constrained,labels=["x","y","z"]);
```



We view the solid perpendicular to the x-y plane.

```
> plot3d([x,-1+(1+x^3)*cos(t),(1+x^3)*sin(t)],x=-1..1,t=0..2*Pi,axes=bo
  xed,orientation = [-90, 0],
  scaling=constrained,labels=["x","y","z"]);
```




```
>
```