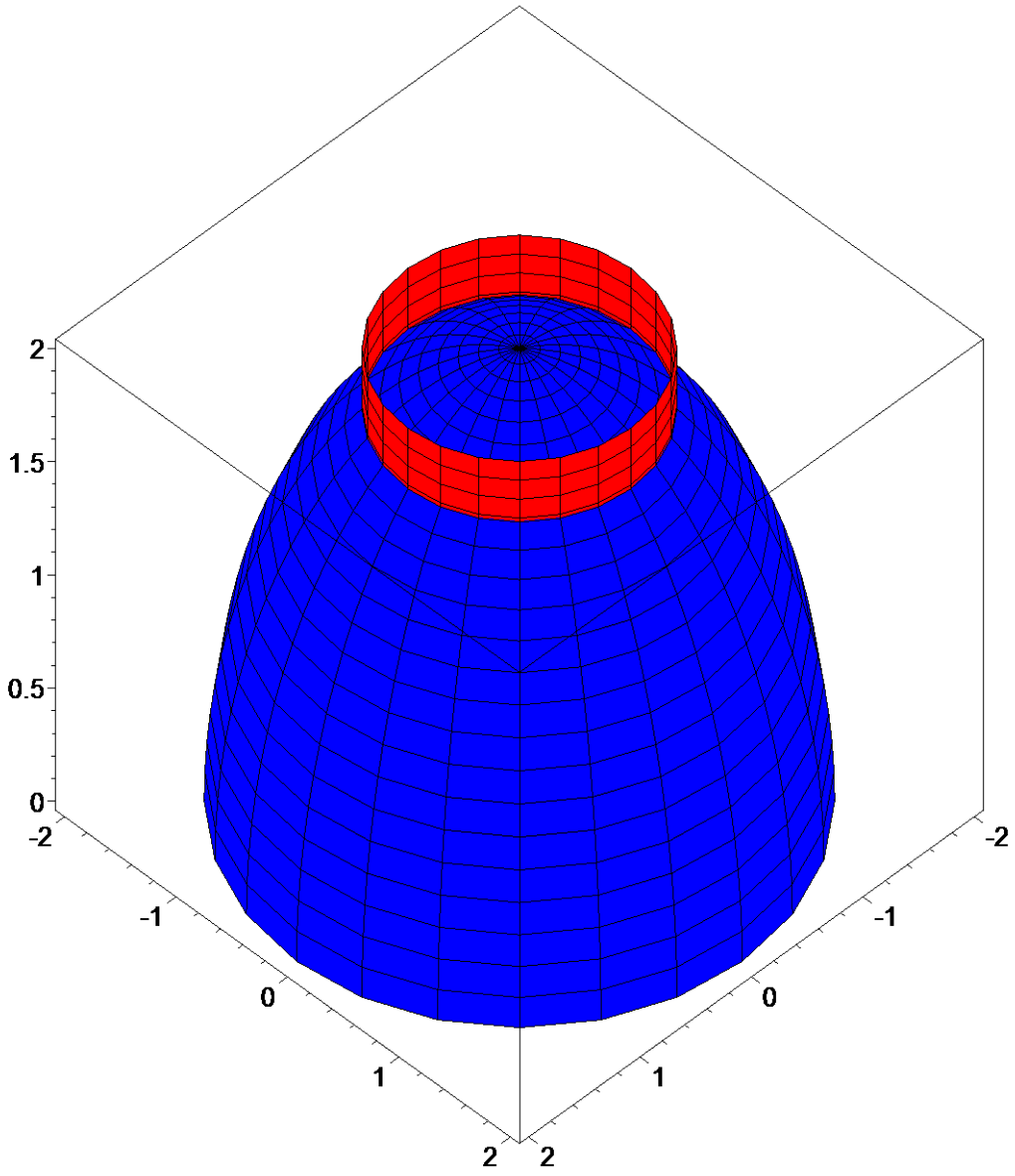
```
> restart:with(student):
  with(plots):# solutions hw P 11127 in reverse order
Warning, the name changecoords has been redefined

> #61
> A1:= plot3d(2,theta=0..2*Pi,phi=0..Pi/2,
  coords=spherical,color=blue, style=patch,axes = boxed):

> A2:= plot3d(1,theta=0..2*Pi,z=0..2, coords=cylindrical,
  color=red,style=patch,axes = boxed):


> display3d(A1,A2);
```




```
> 4*(Int(Int(Int(rho^2 * sin(phi), rho=0..2),phi=0 ..Pi/6),
  theta=0..Pi/2) + Int(Int(Int(rho^2 * sin(phi),
  rho=0..csc(phi)),phi=Pi/6 ..Pi/2), theta=0..Pi/2))
  =4*(int(int(int(rho^2 * sin(phi), rho=0..2),phi=0 ..Pi/6),
  theta=0..Pi/2) +int(int(int(rho^2 * sin(phi),
  rho=0..csc(phi)),phi=Pi/6 ..Pi/2), theta=0..Pi/2))
  ;
```

$$4\int_0^{\frac{\pi}{2}}\int_0^{\frac{\pi}{6}}\int_0^{2}\rho^2\sin(\phi)\,d\rho\,d\phi\,d\theta+4\int_0^{\frac{\pi}{2}}\int_{\frac{\pi}{6}}^{\frac{\pi}{2}}\int_0^{\csc(\phi)}\rho^2\sin(\phi)\,d\rho\,d\phi\,d\theta=-2\sqrt{3}\,\pi+\frac{16}{3}\pi$$

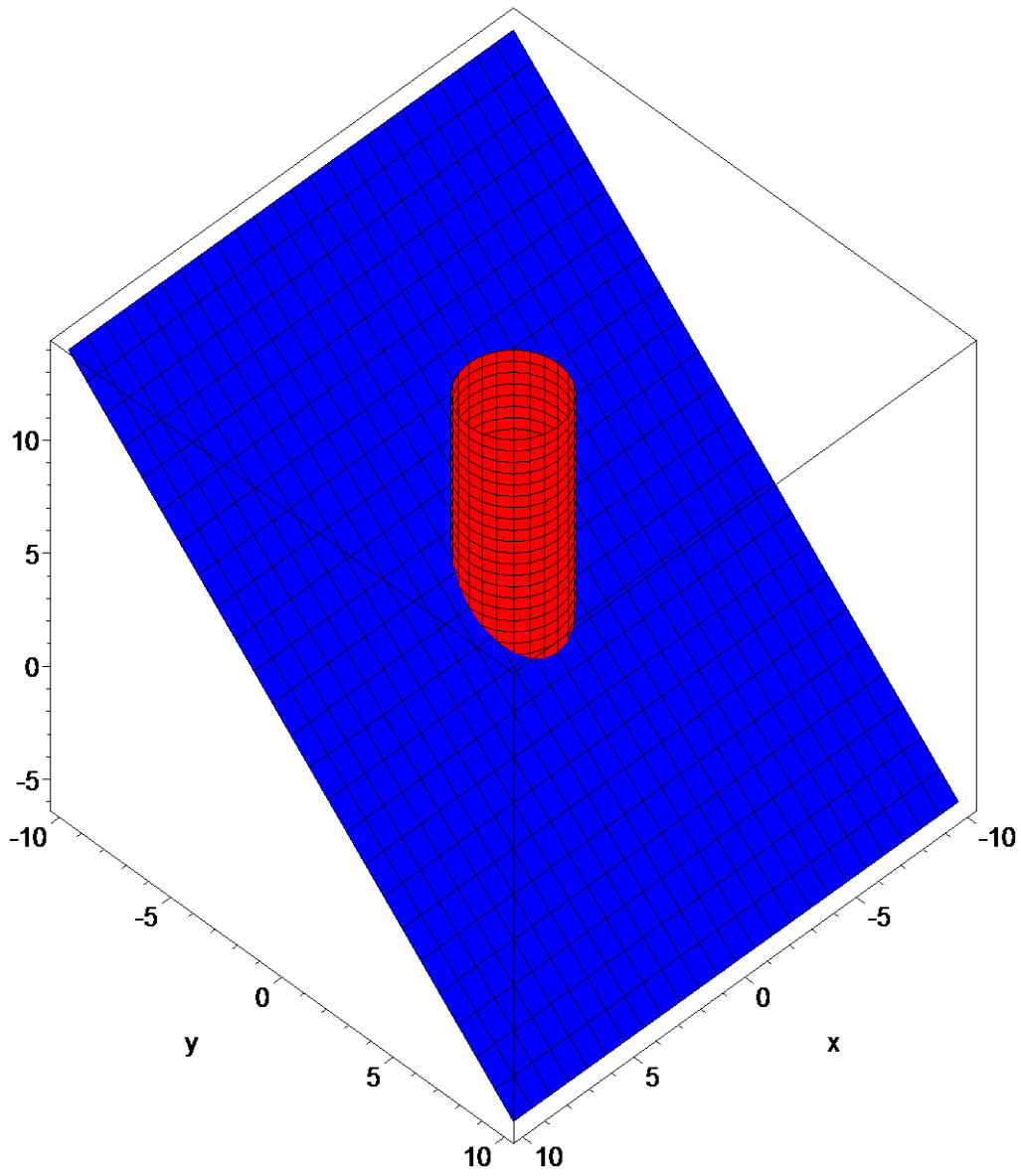
```
> 4*Int(Int(Int(r, z=0..sqrt(4-r^2)),r=0 .. 1), theta=0..Pi/2)
  =4*int(int(int(r, z=0..sqrt(4-r^2)),r=0 .. 1), theta=0..Pi/2);
```

$$4\int_0^{\frac{\pi}{2}}\int_0^{1}\int_0^{\sqrt{4-r^2}} r\,dz\,dr\,d\theta=-2\sqrt{3}\,\pi+\frac{16}{3}\pi$$

```
> #57
> A1:= plot3d(4-y,x=-10..10,y=-10..10, color=blue, style=patch,axes
  = boxed):

> A2:= plot3d(2,theta=0..2*Pi,z=0..12, coords=cylindrical,
  color=red,style=patch,axes = boxed):


> display3d(A1,A2);
```




```
> Int(Int(Int(1, z=0..4-y),x=-sqrt(4-y^2) .. sqrt(4-y^2)), y=-2..2)

  = int(int(int(1, z=0..4-y),x=-sqrt(4-y^2) .. sqrt(4-y^2)),
  y=-2..2);
  # or
```

$$\int_{-2}^{2}\int_{-\sqrt{4-y^2}}^{\sqrt{4-y^2}}\int_{0}^{4-y} 1\, dz\, dx\, dy = 16\,\pi$$

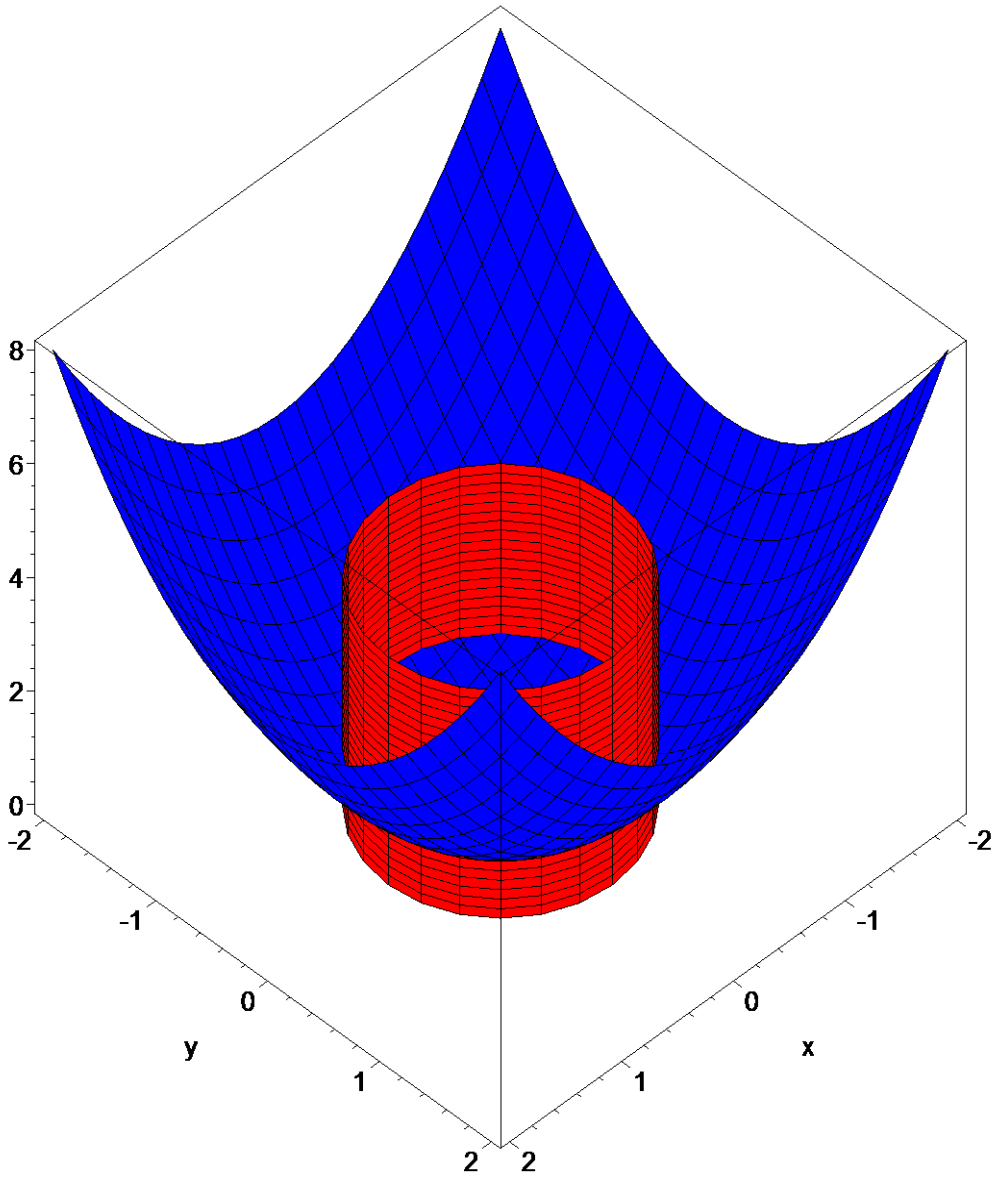
```
> Int(Int(Int(r, z=0..4- r*sin(theta)),r= 0 ..2), theta=0 ..2*Pi) =
  int(int(int(r, z=0..4- r*sin(theta)),r= 0 ..2), theta=0 ..2*Pi);
```

$$\int_0^{2\pi}\int_0^{2}\int_0^{4-r\sin(\theta)} r\,dz\,dr\,d\theta = 16\,\pi$$

```
> #53
> A1:= plot3d(x^2+y^2,x=-2..2,y=-2..2, color=blue, style=patch,axes
  = boxed):

> A2:= plot3d(1,theta=0..2*Pi,z=0..4, coords=cylindrical,
  color=red,style=patch,axes = boxed):


> display3d(A1,A2);
```




```
> 4*Int(Int(Int(1, z=0..x^2+y^2),x=0 .. sqrt(1-y^2)), y=0..1)
  = 4*int(int(int(1, z=0..x^2+y^2),x=0 .. sqrt(1-y^2)), y=0..1) ;#
  or
```

$$4\int_0^1\int_0^{\sqrt{1-y^2}}\int_0^{x^2+y^2} 1\,dz\,dx\,dy = \frac{\pi}{2}$$

```
> 4*Int(Int(Int(r, z=0..r^2),r= 0 ..1), theta=0 ..Pi/2) =
  4*int(int(int(r, z=0..r^2),r= 0 ..1), theta=0 ..Pi/2) ;
```

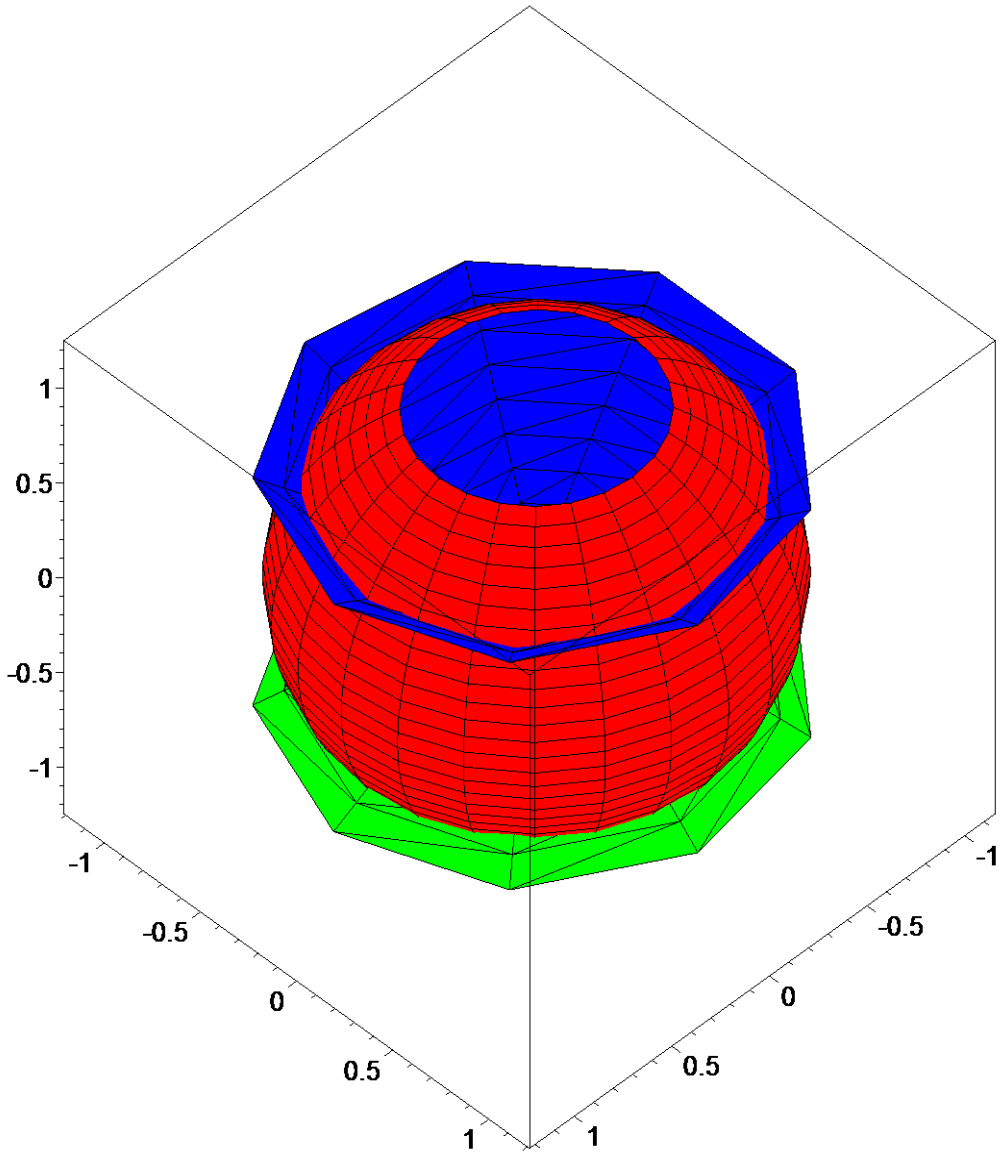
$$4\int_0^{\frac{\pi}{2}}\int_0^{1}\int_0^{r^2} r\,dz\,dr\,d\theta = \frac{\pi}{2}$$

```
> #49 let a be 1
> a:= 1 :
> A1:= plot3d(a,theta=0..2*Pi,phi=Pi/6..3*Pi/4, coords= spherical,
  color=red,style=patch,axes = boxed):

> A2:=implicitplot3d(phi = Pi/3, rho = 0 ..
  1.2,theta=0..2*Pi,phi=0..Pi,coords= spherical,
  color=blue,style=patch,axes = boxed):

> A3:= implicitplot3d(phi = 2*Pi/3,rho = 0 ..
  1.2,theta=0..2*Pi,phi=0..Pi, coords= spherical, color=
  green,style=patch,axes = boxed):

> display3d(A1,A2,A3);
```




```
> Int(Int(Int(rho^2 * sin(phi), rho=0..1),phi= Pi/3 .. 2*Pi/3),
  theta=0..2*Pi)
  = int(int(int(rho^2 * sin(phi), rho=0..1),phi=Pi/3 ..2*Pi/3),
  theta=0..2*Pi);
```

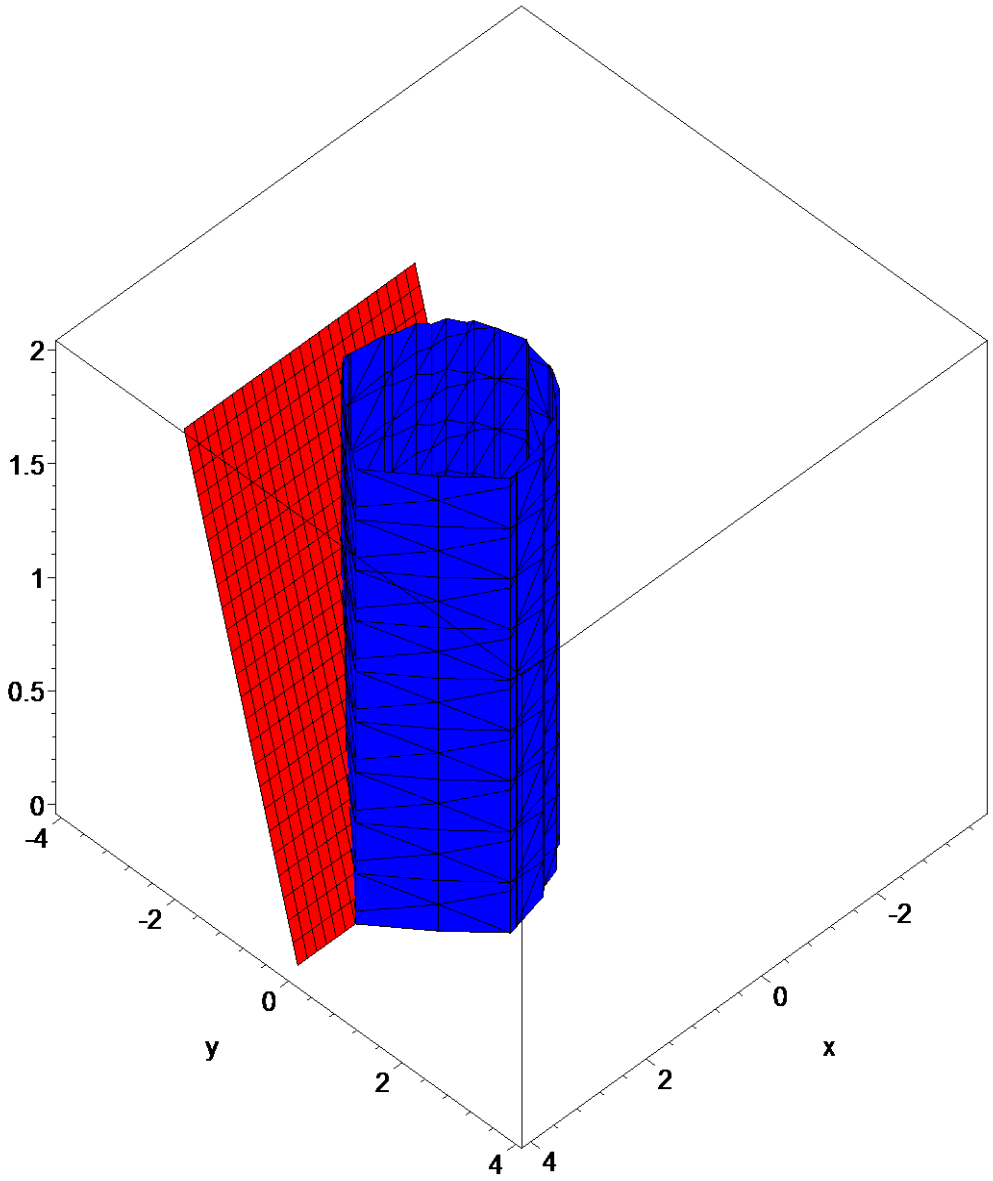
$$\int_0^{2\pi}\int_{\frac{\pi}{3}}^{\frac{2\pi}{3}}\int_0^1 \rho^2 \sin(\phi)\, d\rho\, d\phi\, d\theta = \frac{2\pi}{3}$$

```
> #45
```

```
> A1:= plot3d(-y,x=0 .. 4, y= -2 .. 0, color=red,style=patch,axes =
  boxed):
```

```
> A2:=implicitplot3d(r=3*cos(theta), r = 0 .. 4,theta=0..2*Pi,z=0 ..
  2,coords= cylindrical, color=blue,style=patch,axes = boxed):
```

```
> display3d(A1,A2);
```




```
> Int(Int(Int(r,z=0..-r*sin(theta)), r=0..3*cos(theta)),
  theta=3*Pi/2..2*Pi)
  = int(int(int(r,z=0..-r*sin(theta)), r=0..3*cos(theta)),
  theta=3*Pi/2..2*Pi); # or
```

$$\int_{\frac{3\pi}{2}}^{2\pi}\int_{0}^{3\cos(\theta)}\int_{0}^{-r\sin(\theta)} r\,dz\,dr\,d\theta = \frac{9}{4}$$

```
> Int(Int(Int(1,z=0..-y), y=-sqrt(3*x-x^2).. 0), x=0.. 3)=
  int(int(int(1,z=0..-y), y=-sqrt(3*x-x^2)..0), x=0.. 3) ;
```

$$\int_0^3 \int_{-\sqrt{3x - x^2}}^0 \int_0^{-y} 1 \, dz \, dy \, dx = \frac{9}{4}$$

>