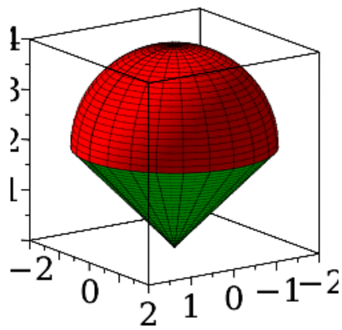
```
> restart : with(plots) :
> # first draw the plots
> pkegel:=plot3d([r,phi,Pi/4],r=0..2*sqrt(2),phi=0..2*Pi,coords=
  spherical,color=green):
  pbol:=plot3d([4*cos(theta),phi,theta],phi=0..2*Pi,theta=0..Pi/4,
  coords=spherical,color=red):
> display(pkegel,pbol)
```



> # *Eerst sferische coordinaten*

> $x := r \cdot \sin(\text{theta}) \cdot \cos(\text{phi})$

$$x := r \sin(\theta) \cos(\phi) \quad \mathbf{(1)}$$

> $y := r \cdot \sin(\text{theta}) \cdot \sin(\text{phi})$

$$y := r \sin(\theta) \sin(\phi) \quad \mathbf{(2)}$$

> $z := r \cdot \cos(\text{theta})$

$$z := r \cos(\theta) \quad \mathbf{(3)}$$

> $j := r^2 \cdot \sin(\text{theta})$

$$j := r^2 \sin(\theta) \quad \mathbf{(4)}$$

> # *hoe is onze r? just fill in into sphere eq*

> $sphere\_eq := x^2 + y^2 + (z - a)^2 = a^2$

$$sphere\_eq := r^2 \sin(\theta)^2 \cos(\phi)^2 + r^2 \sin(\theta)^2 \sin(\phi)^2 + (r \cos(\theta) - a)^2 = a^2 \quad \mathbf{(5)}$$

> $result := solve(sphere\_eq, r)$

$$result := 0, \frac{2 \cos(\theta)\, a}{\sin(\theta)^2 \cos(\phi)^2 + \sin(\theta)^2 \sin(\phi)^2 + \cos(\theta)^2} \quad \mathbf{(6)}$$

> $simplify(result[2\,])$

$$2 \cos(\theta)\, a \quad \mathbf{(7)}$$

> # *so r goes from 0 to 2 ·cos(theta) ·a*

> # *theta goes from zero to 45 degrees*

> # *phi is 360 degrees*

> # *so the mass is:*

> $M := \text{rho} \cdot int\left(int\left(int(j, r = 0\,..2 \cdot \cos(\text{theta}) \cdot a), \text{theta} = 0\,..\frac{\text{Pi}}{4}\right), \text{phi} = 0\,..2 \cdot \text{Pi}\right)$

$$M := \rho\, a^3\, \pi \quad \mathbf{(8)}$$

> # de massa middelpunten zijn dan (zie formules)

> $x\_ := \frac{1}{M} \cdot int\left(int\left(int(\text{rho} \cdot j \cdot x, r = 0..2 \cdot a \cdot \cos(\text{theta})), \text{theta} = 0..\frac{\text{Pi}}{4}\right), \text{phi} = 0..2 \cdot \text{Pi}\right)$

$$x\_ := 0 \qquad (9)$$

> $y\_ := \frac{1}{M} \cdot int\left(int\left(int(\text{rho} \cdot j \cdot y, r = 0..2 \cdot a \cdot \cos(\text{theta})), \text{theta} = 0..\frac{\text{Pi}}{4}\right), \text{phi} = 0..2 \cdot \text{Pi}\right)$

$$y\_ := 0 \qquad (10)$$

> $z\_ := \frac{1}{M} \cdot int\left(int\left(int(\text{rho} \cdot j \cdot z, r = 0..2 \cdot a \cdot \cos(\text{theta})), \text{theta} = 0..\frac{\text{Pi}}{4}\right), \text{phi} = 0..2 \cdot \text{Pi}\right)$

$$z\_ := \frac{7\,a}{6} \qquad (11)$$

> # Nu met cilinder coords, basically hetzelfde.
restart:

> $x := r \cdot \cos(\text{theta})$

$$x := r\cos(\theta) \qquad (12)$$

> $y := r \cdot \sin(\text{theta})$

$$y := r\sin(\theta) \qquad (13)$$

> $z := z$

$$z := z \qquad (14)$$

> $j := r$

$$j := r \qquad (15)$$

> # De theta doet 360

> # De r is van 0 -> a (simply see formula)

> # voor z, steken we de variabelen in de sphere equation

> $sphere\_eq := x^2 + y^2 + (z - a)^2 = a^2$

$$sphere\_eq := r^2\cos(\theta)^2 + r^2\sin(\theta)^2 + (z - a)^2 = a^2 \qquad (16)$$

>
$result := solve(sphere\_eq, z)$

$$result := a + \sqrt{a^2 - r^2},\ a - \sqrt{a^2 - r^2} \qquad (17)$$

> $upperbound\_z := result[1]$

$$upperbound\_z := a + \sqrt{a^2 - r^2} \qquad (18)$$

> # dus z is van a tot upperbound_z

> # vul in in de vorige equations

>