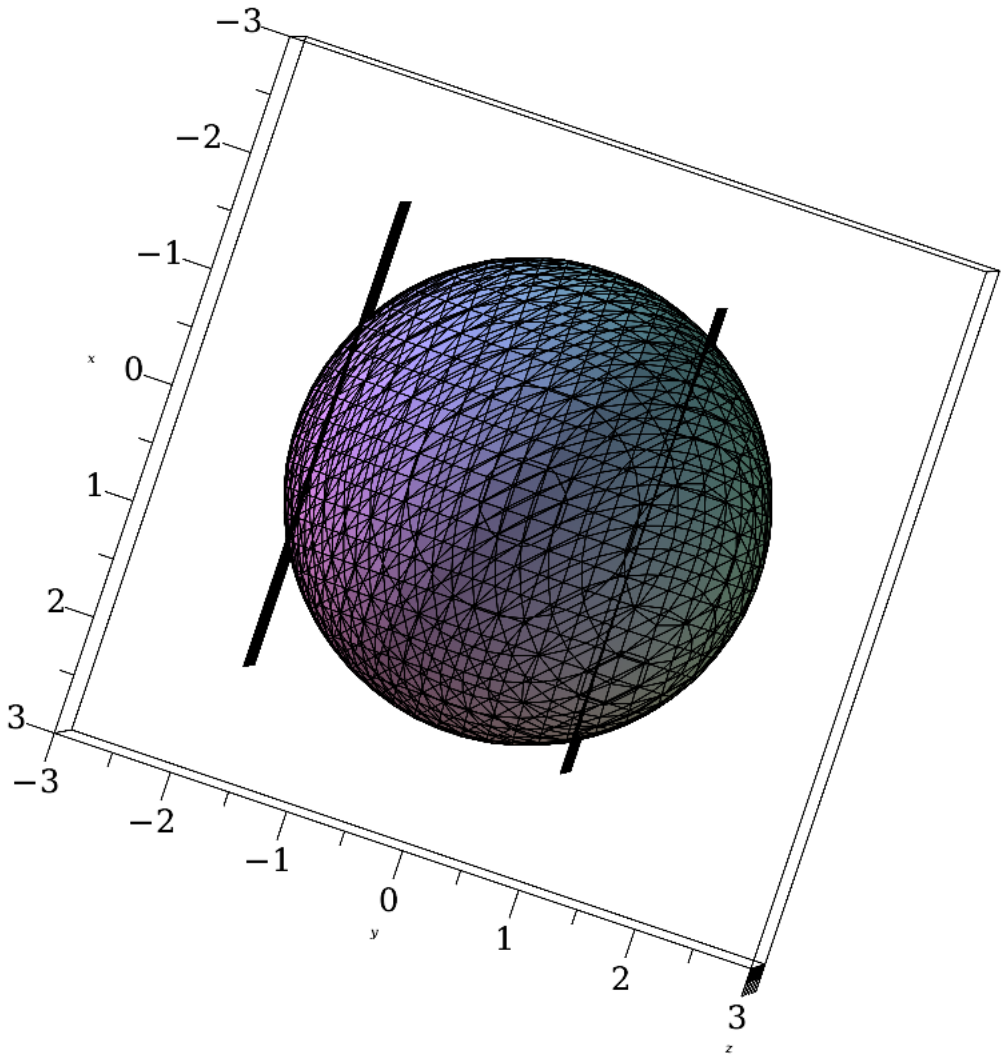
```
> restart : with(LinearAlgebra) : with(plots) : with(plottools) :
      with(VectorCalculus) : SetCoordinates(cartesian[x, y, z]) :
> sphere_ := implicitplot3d(x^2 + y^2 + z^2 = 4) :
> y1 := implicitplot3d(y = 1, x = -2..2, y = 1..2, z = -2..2) :
> y2 := implicitplot3d(y = -sqrt(3), x = -2..2, y = -3..2, z = -2..2) :
> display(sphere_, y1, y2)
```




```
> # First we do exercise C)
> F := VectorField( [y^2, z^2, z^2] ) :
> div := Divergence(F)
```

$$div := 2z \tag{1}$$

```
> div := subs(z = r·cos(theta), div)
```

$$div := 2r\cos(\theta) \tag{2}$$

```
> dV := r^2·sin(theta)
```

$$dV := r^2\sin(\theta) \tag{3}$$

```
> int(int(int(div·dV, r = 0..2), phi = arccos(-sqrt(3)/2)..arccos(1/2)), theta
    = 0..2·Pi)
```

$$0 \tag{4}$$

```
> # Nu part B
> n1 := VectorField([sin(theta)·cos(phi), sin(theta)·sin(phi), cos(theta)]):
> dot1 := simplify(subs([y = 2·sin(theta)·sin(phi), z = 2·cos(theta)], F • n1))
```

$$dot1 := 4\sin(\theta)^3\sin(\phi)^2\cos(\phi) + 4\cos(\theta)^2\sin(\theta)\sin(\phi) + 4\cos(\theta)^3 \tag{5}$$

```
> int_R := int(int(dot1·4·sin(theta), theta = 0..2·Pi), phi = arccos(-sqrt(3)/2)
    ..arccos(1/2))
```

$$int\_R := -\frac{\pi\sqrt{3}}{2} - \frac{5\pi}{2} \tag{6}$$

```
> n2 := VectorField([0, -1, 0]):
> dot2 := simplify(subs([y = 2·sin(theta)·sin(phi), z = 2·cos(theta)], F • n2)):
> int_D1 := int(int(dot2·r, r = 0..1), theta = 0..2·Pi)
```

$$int\_D1 := -2\pi \tag{7}$$

```
> n3 := VectorField([0, 1, 0]):
> dot3 := simplify(subs([y = 2·sin(theta)·sin(phi), z = 2·cos(theta)], F • n3)):
> int_D2 := int(int(dot3·r, r = 0..sqrt(3)), theta = 0..2·Pi)
```

$$int\_D2 := 6\pi \tag{8}$$

```
> # Total integral
> int_R + int_D1 + int_D2
```

$$-\frac{\pi\sqrt{3}}{2} + \frac{3\pi}{2} \tag{9}$$

```
> # I dont fucking know leave me alone.
>
```