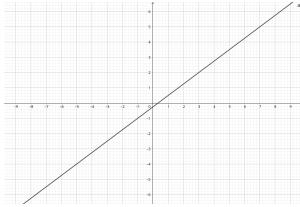
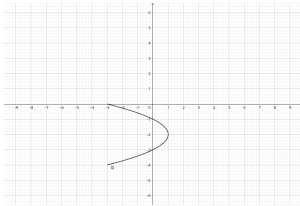


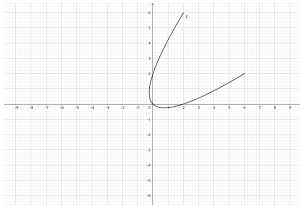
1. a) $\blacksquare x = 3 - 4t \Rightarrow \star : \frac{-x+3}{4} = t$
 $\blacksquare y = 2 - 3t \xRightarrow{\star} y = 2 - 3\left(\frac{-x+3}{4}\right) \equiv y = \frac{3x}{4} - \frac{1}{4}$



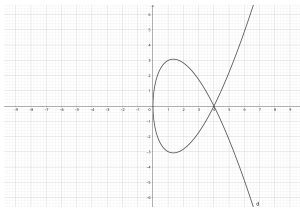
- b) $\blacksquare x = 1 - t^2$
 $\blacksquare y = t - 2$
 $\blacksquare -2 \leq t \leq 2$
 \blacksquare No es función



- c) $\blacksquare x = t^2 + t$
 $\blacksquare y = t^2 - t$
 $\blacksquare -2 \leq t \leq 2$
 \blacksquare No es función

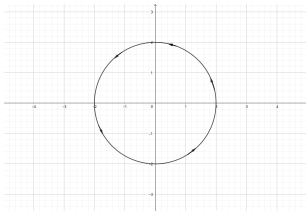


- d) $\blacksquare x = t^2$
 $\blacksquare y = t^3 - 4t$
 $\blacksquare -3 \leq t \leq 3$
 \blacksquare No es función



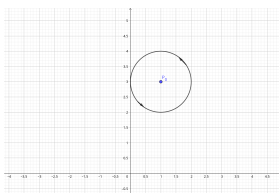
2. a) $\blacksquare r = 2$
 $\blacksquare p = (0, 0)$
 $\blacksquare x^2 + y^2 = 4$
 $\begin{cases} x(t) = 2 \cdot \cos(t) \\ y(t) = 2 \cdot \sin(t) \\ 0 \leq t < 2\pi \end{cases}$

t	x	y
$\frac{\pi}{2}$	0	2
π	-2	0
$\frac{3\pi}{2}$	0	-2



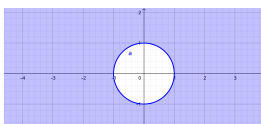
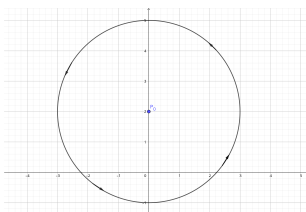
- b) ■ $r = 1$
 ■ $p = (1, 3)$
 ■ $(x - 1)^2 + (y - 3)^2 = 1$
 ■ $\begin{cases} x(t) = 1 + \cos(t) \\ y(t) = 3 + \sin(t) \\ 0 \leq t < 2\pi \end{cases}$

t	x	y
$\frac{\pi}{2}$	1	4
π	0	3
$\frac{3\pi}{2}$	1	2

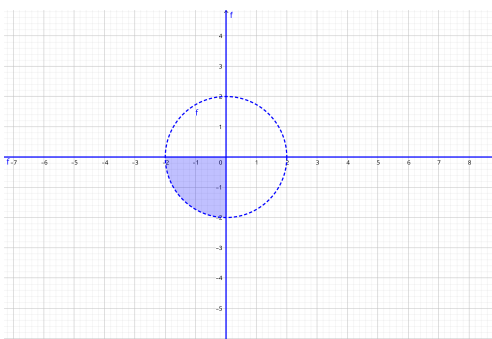


- c) ■ $r = 3$
 ■ $p = (0, 2)$
 ■ $(x)^2 + (y - 2)^2 = 9$
 ■ $\begin{cases} x(t) = 3 \cdot \cos(t) \\ y(t) = 2 + 3 \sin(t) \\ 0 \leq t < 2\pi \end{cases}$

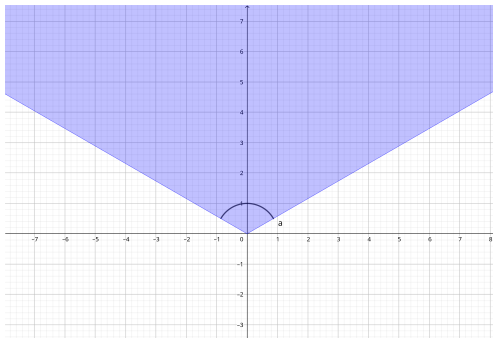
t	x	y
$\frac{\pi}{2}$	0	5
π	-3	2
$\frac{3\pi}{2}$	0	-1



3. a)



b)

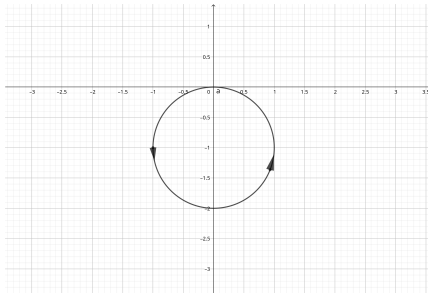


c)

4. a) ■ $\star : r = -2 \sin(\theta)$
 ■ $x = \cos(\theta) \star r \xrightarrow{\star} x = \cos(\theta) \cdot (-2 \sin(\theta))$
 ■ $x = \sin(\theta) \star r \xrightarrow{\star} y = -2 \sin^2(\theta)$

$$\begin{cases} x(t) = -2 \cdot \cos(t) \sin(t) \\ y(t) = -2 \sin^2(\theta) \\ 0 \leq t < \pi \end{cases}$$

t	x	y
$\frac{\pi}{4}$	-1	-1
$\frac{\pi}{2}$	0	-2
π	0	0
$\frac{3\pi}{4}$	1	-1



- b) ■ $\star : r = 1 - \cos(\theta)$
 ■ $x = r \cdot \cos(\theta) \xrightarrow{\star} x = \cos(\theta) - \cos^2(\theta)$
 ■ $y = r \cdot \sin(\theta) \xrightarrow{\star} y = \sin(\theta) - \sin(\theta) \cdot \cos(\theta)$

$$r = \sqrt{x^2 + t^2} \xrightarrow{\star}$$

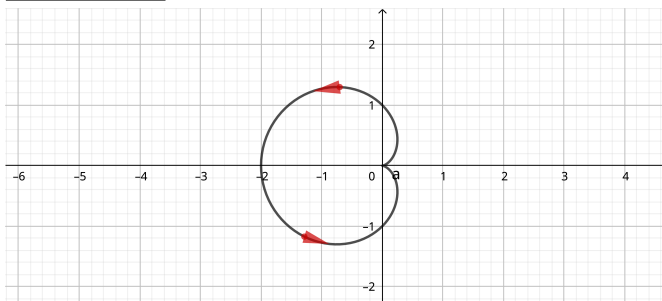
$$\sqrt{x^2 + t^2} = 1 - \cos(\theta) \quad \cos(\theta) = \frac{x}{\sqrt{x^2 + y^2}} \equiv$$

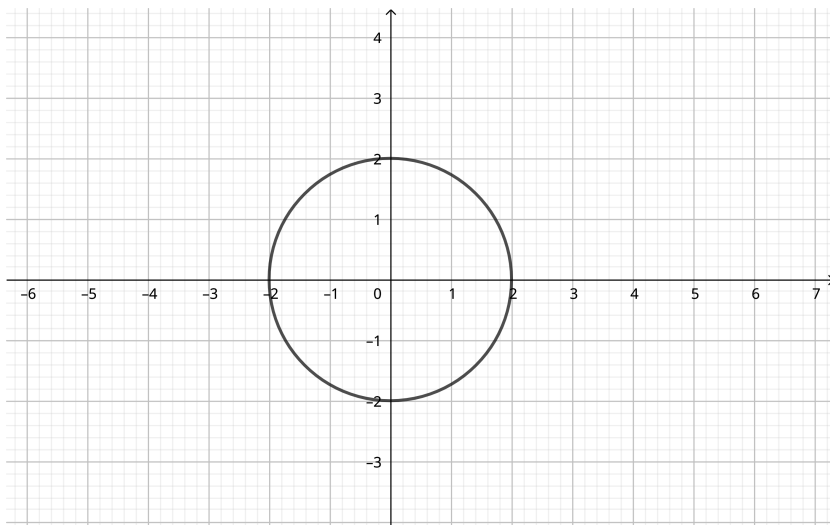
$$\sqrt{x^2 + t^2} = 1 - \frac{x}{\sqrt{x^2 + y^2}} \equiv$$

$$x^2 + y^2 = \sqrt{x^2 + y^2} - x$$

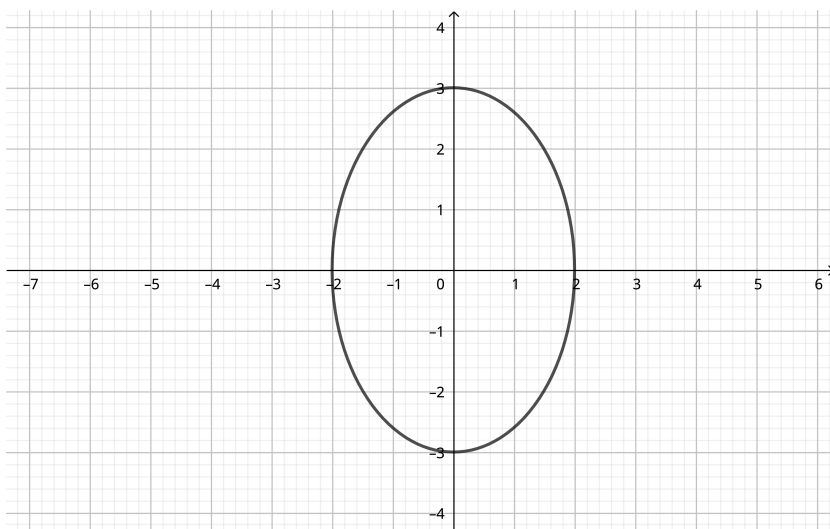
$$\begin{cases} x(\theta) = \cos(\theta) - \cos^2(\theta) \\ y(\theta) = \sin(\theta) - \sin(\theta) \cdot \cos(\theta) \\ 0 \leq \theta < 2\pi \end{cases}$$

t	x	y
0	0	0
π	-2	0

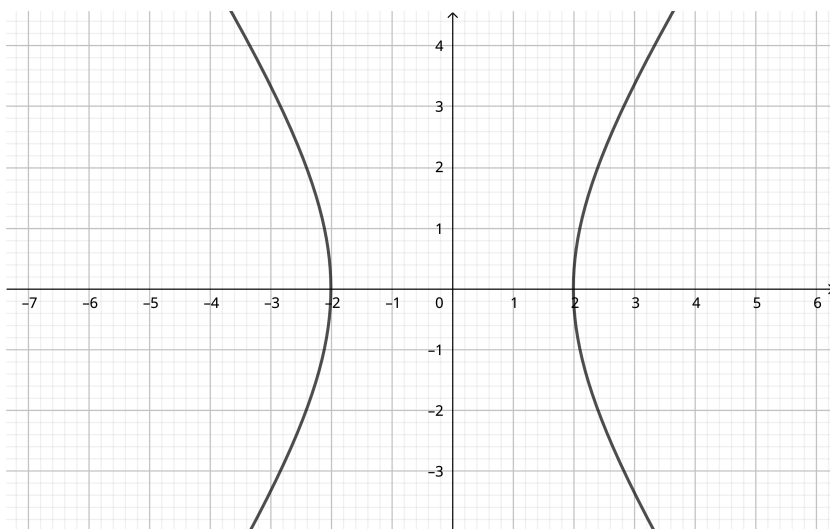




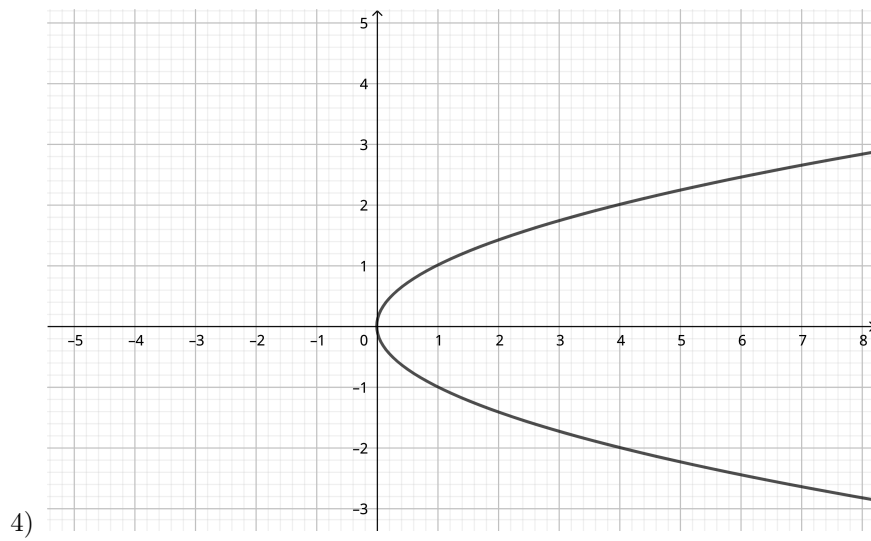
5. a) 1)



2)

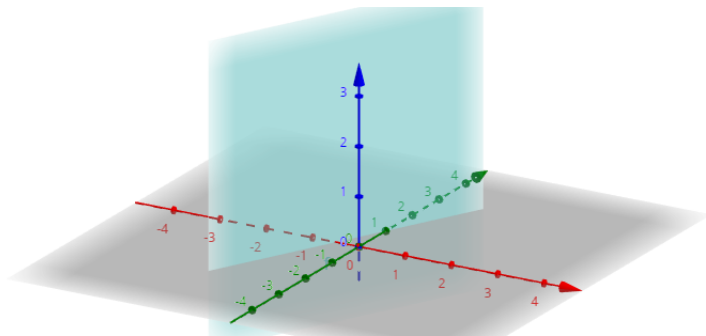


3)

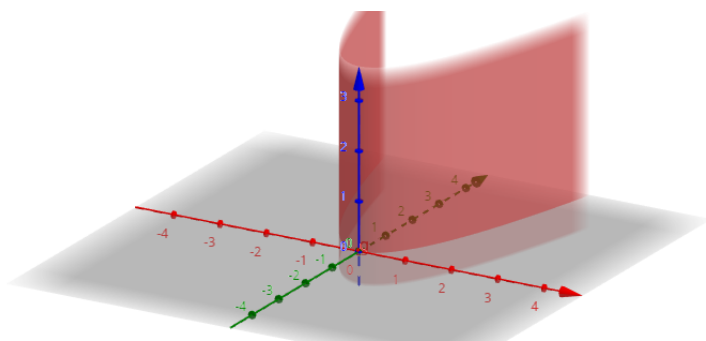


b) Son curvas de nivel, a mayor a mayor ancho, a mayor b mayor altura

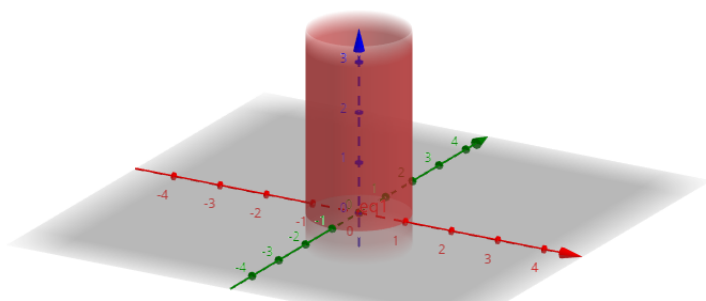
6. a)

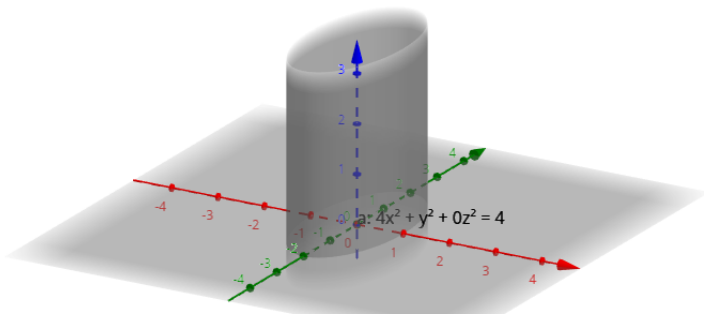


b)



c)





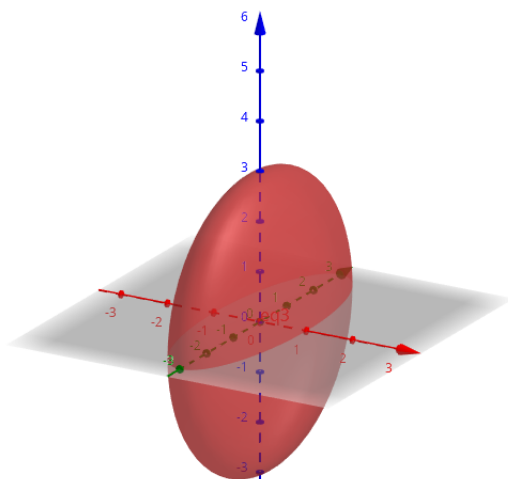
d)

7. a) 1) $x^2 + \frac{y^2}{4} + \frac{z^2}{9} = 1$

- • $\begin{matrix} z=-2 \\ \Rightarrow \end{matrix} x^2 + \frac{y^2}{9} + \frac{4}{9} = 1$ Una ellipse
- $\begin{matrix} z=-1 \\ \Rightarrow \end{matrix} x^2 + \frac{y^2}{9} + \frac{1}{9} = 1$ Una ellipse
- $\begin{matrix} z=0 \\ \Rightarrow \end{matrix} x^2 + \frac{y^2}{9} = 1$ Circulo
- $\begin{matrix} z=1 \\ \Rightarrow \end{matrix} x^2 + \frac{y^2}{9} + \frac{1}{9} = 1$ Una ellipse
- $\begin{matrix} z=2 \\ \Rightarrow \end{matrix} x^2 + \frac{y^2}{9} + \frac{4}{9} = 1$ Una ellipse

- • $\begin{matrix} y=-2 \\ \Rightarrow \end{matrix} x^2 + \frac{4}{9} + \frac{z^2}{9} = 1$ Una ellipse
- $\begin{matrix} y=-1 \\ \Rightarrow \end{matrix} x^2 + \frac{1}{9} + \frac{z^2}{9} = 1$ Una ellipse
- $\begin{matrix} y=0 \\ \Rightarrow \end{matrix} x^2 + \frac{z^2}{9} = 1$ Circulo
- $\begin{matrix} y=1 \\ \Rightarrow \end{matrix} x^2 + \frac{1}{9} + \frac{z^2}{9} = 1$ Una ellipse
- $\begin{matrix} y=2 \\ \Rightarrow \end{matrix} x^2 + \frac{4}{9} + \frac{z^2}{9} = 1$ Una ellipse

- • $\begin{matrix} x=-2 \\ \Rightarrow \end{matrix} 4 + \frac{y^2}{9} + \frac{z^2}{9} = 1$ Circulo
- $\begin{matrix} x=-1 \\ \Rightarrow \end{matrix} 1 + \frac{y^2}{9} + \frac{z^2}{9} = 1$ Circulo
- $\begin{matrix} x=0 \\ \Rightarrow \end{matrix} \frac{y^2}{9} + \frac{z^2}{9} = 1$ Circulo
- $\begin{matrix} x=1 \\ \Rightarrow \end{matrix} 1 + \frac{y^2}{9} + \frac{z^2}{9} = 1$ Circulo
- $\begin{matrix} x=2 \\ \Rightarrow \end{matrix} 4 + \frac{y^2}{9} + \frac{z^2}{9} = 1$ Circulo

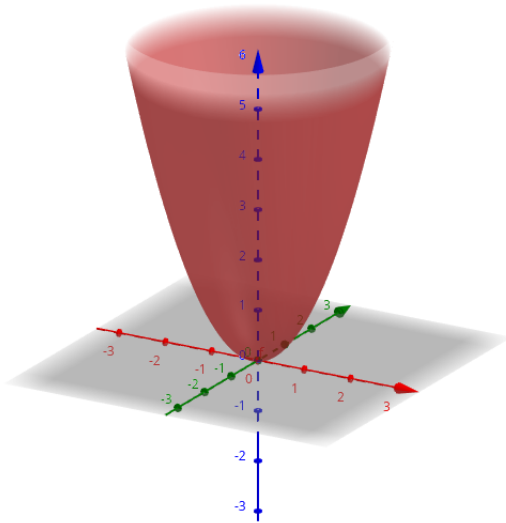


2) $z = x^2 + y^2$

- • $\begin{matrix} z=0 \\ \Rightarrow \end{matrix} x^2 + y^2 = 0$ un punto
- $\begin{matrix} z=1 \\ \Rightarrow \end{matrix} x^2 + y^2 = 1$ Un círculo con centro en (0,0) y radio 1
- $\begin{matrix} z=2 \\ \Rightarrow \end{matrix} x^2 + y^2 = 2$ Un círculo con centro en (0,0) y radio $\sqrt{2}$

- • $\begin{matrix} y=-2 \\ \Rightarrow \end{matrix} x^2 + 4 = z$ Una parábola
- $\begin{matrix} y=-1 \\ \Rightarrow \end{matrix} x^2 + 1 = z$ Una parábola
- $\begin{matrix} y=0 \\ \Rightarrow \end{matrix} x^2 + 0 = z$ Una parábola
- $\begin{matrix} y=1 \\ \Rightarrow \end{matrix} x^2 + 1 = z$ Una parábola
- $\begin{matrix} y=2 \\ \Rightarrow \end{matrix} x^2 + 4 = z$ Una parábola

- • $\begin{matrix} x=-2 \\ \Rightarrow \end{matrix} 4 + y^2 = z$ Una parábola
- $\begin{matrix} x=-1 \\ \Rightarrow \end{matrix} 1 + y^2 = z$ Una parábola
- $\begin{matrix} x=0 \\ \Rightarrow \end{matrix} 0 + y^2 = z$ Una parábola
- $\begin{matrix} x=1 \\ \Rightarrow \end{matrix} 1 + y^2 = z$ Una parábola
- $\begin{matrix} x=2 \\ \Rightarrow \end{matrix} 4 + y^2 = z$ Una parábola



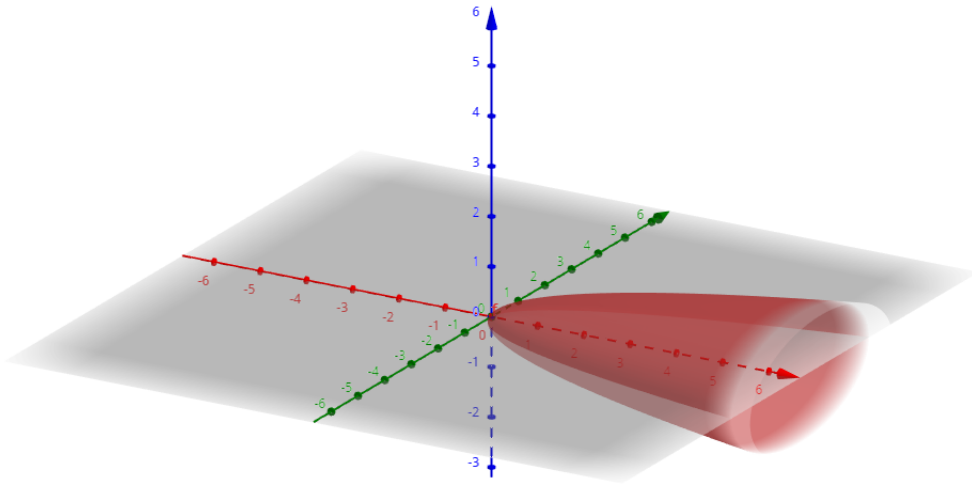
3) $x = y^2 + 4z^2$

- • $\begin{matrix} z=-2 \\ \Rightarrow \end{matrix} x = y^2 + 16$ Una parábola
- $\begin{matrix} z=-1 \\ \Rightarrow \end{matrix} x = y^2 + 4$ Una parábola
- $\begin{matrix} z=0 \\ \Rightarrow \end{matrix} x = y^2 +$ Una parábola
- $\begin{matrix} z=1 \\ \Rightarrow \end{matrix} x = y^2 + 4$ Una parábola
- $\begin{matrix} z=2 \\ \Rightarrow \end{matrix} x = y^2 + 16$ Una parábola

- • $\begin{matrix} y=-2 \\ \Rightarrow \end{matrix} x = 4 + 4z^2$ Una parábola
- $\begin{matrix} y=-1 \\ \Rightarrow \end{matrix} x = 1 + 4z^2$ Una parábola
- $\begin{matrix} y=0 \\ \Rightarrow \end{matrix} x = 0 + 4z^2$ Una parábola
- $\begin{matrix} y=1 \\ \Rightarrow \end{matrix} x = 1 + 4z^2$ Una parábola
- $\begin{matrix} y=2 \\ \Rightarrow \end{matrix} x = 4 + 4z^2$ Una parábola

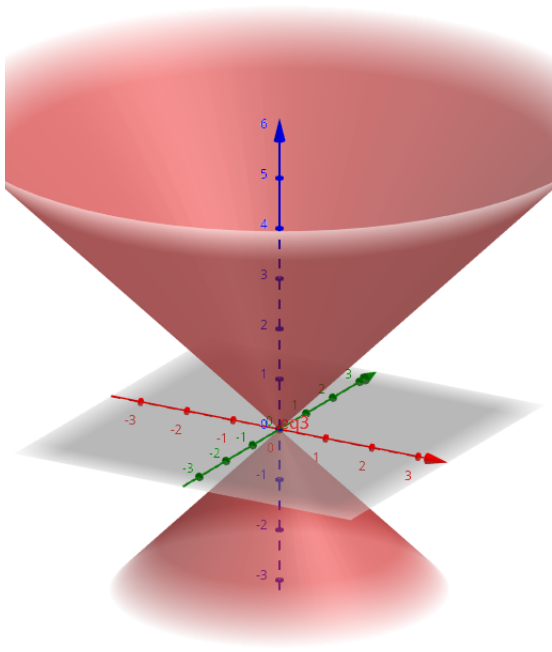
- • $\begin{matrix} x=0 \\ \Rightarrow \end{matrix} x = y^2 + 4z^2$ Un punto

- $\begin{matrix} x=1 \\ \Rightarrow \end{matrix} 1 = y^2 + 4z^2$ Una elipse
- $\begin{matrix} x=2 \\ \Rightarrow \end{matrix} 2 = y^2 + 4z^2$ Una elipse



4) $z^2 = x^2 + y^2$

- • $\begin{matrix} z=-2 \\ \Rightarrow \end{matrix} 4 = x^2 + y^2$ Un círculo con centro en (0,0) y radio $\sqrt{2}$
- $\begin{matrix} z=-1 \\ \Rightarrow \end{matrix} 1 = x^2 + y^2$ Un círculo con centro en (0,0) y radio 1
- $\begin{matrix} z=0 \\ \Rightarrow \end{matrix} 0 = x^2 + y^2$ Un punto
- $\begin{matrix} z=1 \\ \Rightarrow \end{matrix} 1 = x^2 + y^2$ Un círculo con centro en (0,0) y radio 1
- $\begin{matrix} z=2 \\ \Rightarrow \end{matrix} 4 = x^2 + y^2$ Un círculo con centro en (0,0) y radio $\sqrt{2}$
- • $\begin{matrix} y=-2 \\ \Rightarrow \end{matrix} z^2 - x^2 = 4$ Hiperbola
- $\begin{matrix} y=-1 \\ \Rightarrow \end{matrix} z^2 - x^2 = 1$ Hiperbola
- $\begin{matrix} y=0 \\ \Rightarrow \end{matrix} z^2 - x^2 = 0$ Una X
- $\begin{matrix} y=1 \\ \Rightarrow \end{matrix} z^2 - x^2 = 1$ Hiperbola
- $\begin{matrix} y=2 \\ \Rightarrow \end{matrix} z^2 - x^2 = 4$ Hiperbola
- • $\begin{matrix} x=-2 \\ \Rightarrow \end{matrix} z^2 - y^2 = 4$ Hiperbola
- $\begin{matrix} x=-1 \\ \Rightarrow \end{matrix} z^2 - y^2 = 1$ Hiperbola
- $\begin{matrix} x=0 \\ \Rightarrow \end{matrix} z^2 - y^2 = 0$ Una x
- $\begin{matrix} x=1 \\ \Rightarrow \end{matrix} z^2 - y^2 = 1$ Hiperbola
- $\begin{matrix} x=2 \\ \Rightarrow \end{matrix} z^2 - y^2 = 4$ Hiperbola

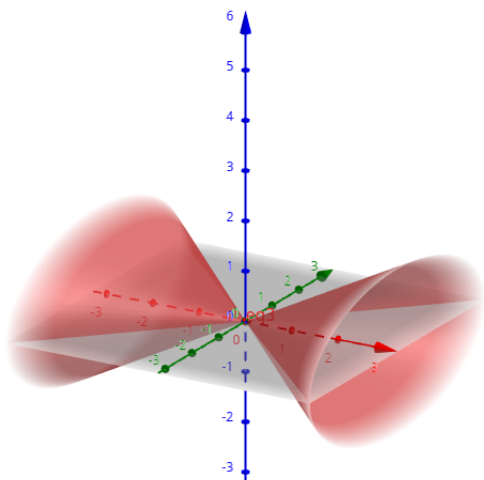


5) $x^2 = y^2 + 4z^2$

- • $\begin{matrix} z=-2 \\ \Rightarrow \end{matrix} x^2 = y^2 + 16$ Hiperbola
- $\begin{matrix} z=-1 \\ \Rightarrow \end{matrix} x^2 = y^2 + 4$ Hiperbola
- $\begin{matrix} z=0 \\ \Rightarrow \end{matrix} x^2 = y^2$ Un punto
- $\begin{matrix} z=1 \\ \Rightarrow \end{matrix} x^2 = y^2 + 4$ Hiperbola
- $\begin{matrix} z=2 \\ \Rightarrow \end{matrix} x^2 = y^2 + 16$ Hiperbola

- • $\begin{matrix} y=-2 \\ \Rightarrow \end{matrix} x^2 = 4 + 4z^2$ Hiperbola
- $\begin{matrix} y=-1 \\ \Rightarrow \end{matrix} x^2 = 1 + 4z^2$ Hiperbola
- $\begin{matrix} y=0 \\ \Rightarrow \end{matrix} x^2 = 4z^2$ Una X
- $\begin{matrix} y=1 \\ \Rightarrow \end{matrix} x^2 = 1 + 4z^2$ Hiperbola
- $\begin{matrix} y=2 \\ \Rightarrow \end{matrix} x^2 = 4 + 4z^2$ Hiperbola

- • $\begin{matrix} x=-2 \\ \Rightarrow \end{matrix} 4 = y^2 + 4z^2$ Un elipse
- $\begin{matrix} x=-1 \\ \Rightarrow \end{matrix} 1 = y^2 + 4z^2$ Un elipse
- $\begin{matrix} x=0 \\ \Rightarrow \end{matrix} 0 = y^2 + 4z^2$ Un punto
- $\begin{matrix} x=1 \\ \Rightarrow \end{matrix} 1 = y^2 + 4z^2$ Un elipse
- $\begin{matrix} x=2 \\ \Rightarrow \end{matrix} 4 = y^2 + 4z^2$ Un elipse



6) $z = x^2 - y^2$

■ • $\begin{matrix} z=-2 \\ \Rightarrow \end{matrix} -2 = x^2 - y^2$ Hiperbola

• $\begin{matrix} z=-1 \\ \Rightarrow \end{matrix} -1 = x^2 - y^2$ Hiperbola

• $\begin{matrix} z=0 \\ \Rightarrow \end{matrix} y^2 = x^2$ Ejes de 45°

• $\begin{matrix} z=1 \\ \Rightarrow \end{matrix} 1 = x^2 - y^2$ Hiperbola

• $\begin{matrix} z=2 \\ \Rightarrow \end{matrix} 2 = x^2 - y^2$ Hiperbola

■ • $\begin{matrix} y=-2 \\ \Rightarrow \end{matrix} z = x^2 - 4$ Parabola

• $\begin{matrix} y=-1 \\ \Rightarrow \end{matrix} z = x^2 - 1$ Parabola

• $\begin{matrix} y=0 \\ \Rightarrow \end{matrix} z = x^2 - 0$ Parabola

• $\begin{matrix} y=1 \\ \Rightarrow \end{matrix} z = x^2 - 1$ Parabola

• $\begin{matrix} y=2 \\ \Rightarrow \end{matrix} z = x^2 - 4$ Parabola

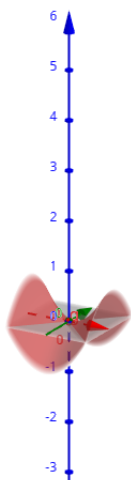
■ • $\begin{matrix} x=-2 \\ \Rightarrow \end{matrix} z = 4 - y^2$ Parabola

• $\begin{matrix} x=-1 \\ \Rightarrow \end{matrix} z = 1 - y^2$ Parabola

• $\begin{matrix} x=0 \\ \Rightarrow \end{matrix} z = 0 - y^2$ Parabola

• $\begin{matrix} x=1 \\ \Rightarrow \end{matrix} z = 1 - y^2$ Parabola

• $\begin{matrix} x=2 \\ \Rightarrow \end{matrix} z = 4 - y^2$ Parabola

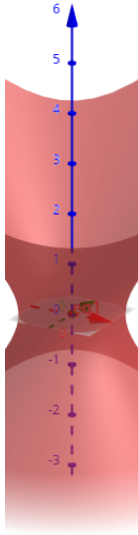


7) $x^2 + y^2 - z^2 = 1$

- • $\begin{matrix} z=-2 \\ \Rightarrow \end{matrix} x^2 + y^2 - 4 = 1$ Circulo
- $\begin{matrix} z=-1 \\ \Rightarrow \end{matrix} x^2 + y^2 - 1 = 1$ Circulo
- $\begin{matrix} z=0 \\ \Rightarrow \end{matrix} x^2 + y^2 - 0 = 1$ Circulo
- $\begin{matrix} z=1 \\ \Rightarrow \end{matrix} x^2 + y^2 - 1 = 1$ Circulo
- $\begin{matrix} z=2 \\ \Rightarrow \end{matrix} x^2 + y^2 - 4 = 1$ Circulo

- • $\begin{matrix} y=-2 \\ \Rightarrow \end{matrix} x^2 + 4 - z^2 = 1$ Hiperbola
- $\begin{matrix} y=-1 \\ \Rightarrow \end{matrix} x^2 + 1 - z^2 = 1$ Hiperbola
- $\begin{matrix} y=0 \\ \Rightarrow \end{matrix} x^2 + 0 - z^2 = 1$ Hiperbola
- $\begin{matrix} y=1 \\ \Rightarrow \end{matrix} x^2 + 1 - z^2 = 1$ Hiperbola
- $\begin{matrix} y=2 \\ \Rightarrow \end{matrix} x^2 + 4 - z^2 = 1$ Hiperbola

- • $\begin{matrix} x=-2 \\ \Rightarrow \end{matrix} 4 + y^2 - z^2 = 1$ Hiperbola
- $\begin{matrix} x=-1 \\ \Rightarrow \end{matrix} 1 + y^2 - z^2 = 1$ Hiperbola
- $\begin{matrix} x=0 \\ \Rightarrow \end{matrix} 0 + y^2 - z^2 = 1$ Hiperbola
- $\begin{matrix} x=1 \\ \Rightarrow \end{matrix} 1 + y^2 - z^2 = 1$ Hiperbola
- $\begin{matrix} x=2 \\ \Rightarrow \end{matrix} 4 + y^2 - z^2 = 1$ Hiperbola

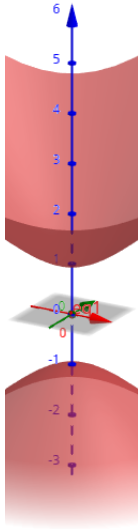


8) $-x^2 - y^2 + z^2 = 1$

- • $\begin{matrix} z=-2 \\ \Rightarrow \end{matrix} -x^2 - y^2 + 4 = 1$ Circulo
- $\begin{matrix} z=-1 \\ \Rightarrow \end{matrix} -x^2 - y^2 + 2 = 1$ Circulo
- $\begin{matrix} z=0 \\ \Rightarrow \end{matrix} -x^2 - y^2 + 1 = 1$ Circulo
- $\begin{matrix} z=1 \\ \Rightarrow \end{matrix} -x^2 - y^2 + 2 = 1$ Circulo
- $\begin{matrix} z=2 \\ \Rightarrow \end{matrix} -x^2 - y^2 + 4 = 1$ Circulo

- • $\begin{matrix} y=-2 \\ \Rightarrow \end{matrix} -x^2 - 4 + z^2 = 1$ Hiperbola
- $\begin{matrix} y=-1 \\ \Rightarrow \end{matrix} -x^2 - 2 + z^2 = 1$ Hiperbola
- $\begin{matrix} y=0 \\ \Rightarrow \end{matrix} -x^2 - 1 + z^2 = 1$ Hiperbola
- $\begin{matrix} y=1 \\ \Rightarrow \end{matrix} -x^2 - 2 + z^2 = 1$ Hiperbola
- $\begin{matrix} y=2 \\ \Rightarrow \end{matrix} -x^2 - 4 + z^2 = 1$ Hiperbola

- • $\begin{matrix} x=-2 \\ \Rightarrow \end{matrix} -4 - y^2 + z^2 = 1$ Hiperbola
- $\begin{matrix} x=-1 \\ \Rightarrow \end{matrix} -2 - y^2 + z^2 = 1$ Hiperbola
- $\begin{matrix} x=0 \\ \Rightarrow \end{matrix} -1 - y^2 + z^2 = 1$ Hiperbola
- $\begin{matrix} x=1 \\ \Rightarrow \end{matrix} -2 - y^2 + z^2 = 1$ Hiperbola
- $\begin{matrix} x=2 \\ \Rightarrow \end{matrix} -4 - y^2 + z^2 = 1$ Hiperbola

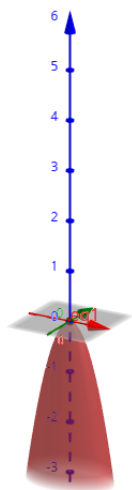


9) $4x^2 + 9y^2 + z = 0$

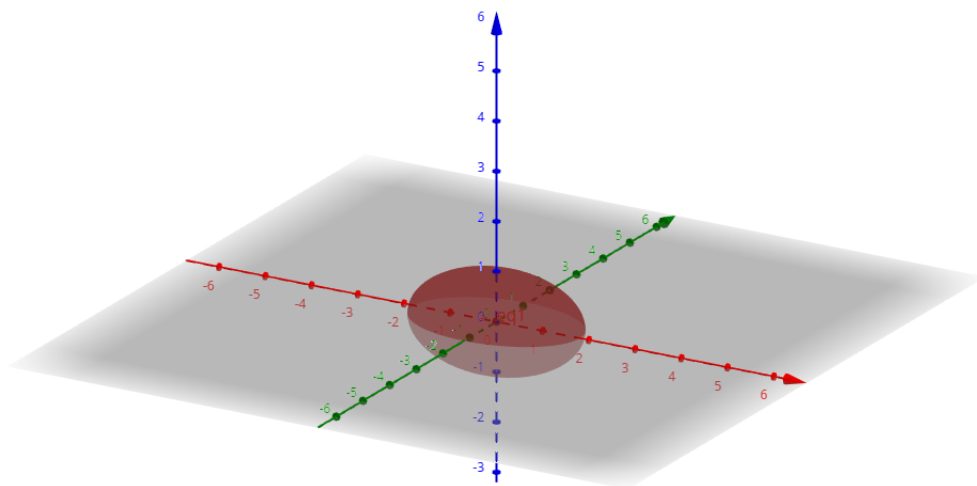
- • $\begin{matrix} z=-2 \\ \Rightarrow \end{matrix} 4x^2 + 9y^2 + (-2) = 0$ Ellipse
- $\begin{matrix} z=-1 \\ \Rightarrow \end{matrix} 4x^2 + 9y^2 + (-1) = 0$ Ellipse
- $\begin{matrix} z=0 \\ \Rightarrow \end{matrix} 4x^2 + 9y^2 = 0$ Ellipse
- $\begin{matrix} z=1 \\ \Rightarrow \end{matrix} 4x^2 + 9y^2 + 1 = 0$ Ellipse
- $\begin{matrix} z=2 \\ \Rightarrow \end{matrix} 4x^2 + 9y^2 + 2 = 0$ Ellipse

- • $\begin{matrix} y=-2 \\ \Rightarrow \end{matrix} 4x^2 + 18 + z = 0$ Parabola
- $\begin{matrix} y=-1 \\ \Rightarrow \end{matrix} 4x^2 + 9 + z = 0$ Parabola
- $\begin{matrix} y=0 \\ \Rightarrow \end{matrix} 4x^2 + z = 0$ Parabola
- $\begin{matrix} y=1 \\ \Rightarrow \end{matrix} 4x^2 + 9 + z = 0$ Parabola
- $\begin{matrix} y=2 \\ \Rightarrow \end{matrix} 4x^2 + 18 + z = 0$ Parabola

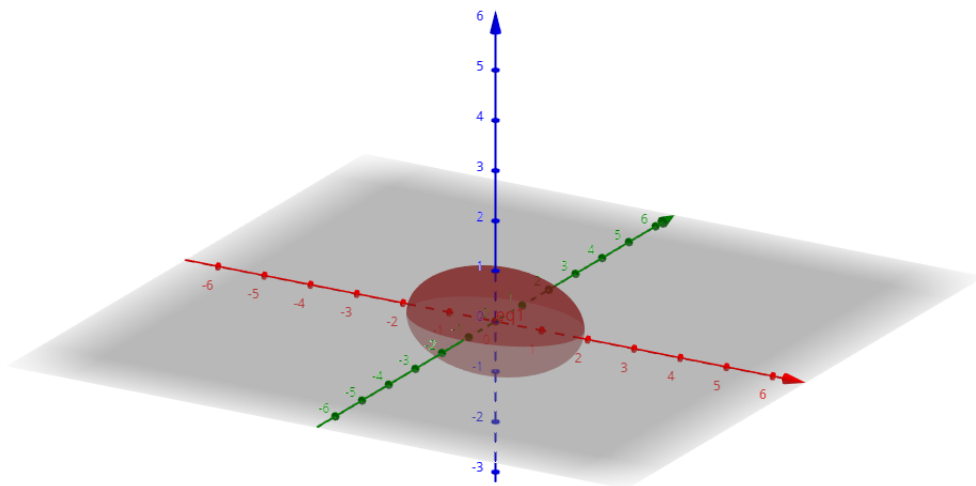
- • $\begin{matrix} x=-2 \\ \Rightarrow \end{matrix} 16 + 9y^2 + z = 0$ Parabola
- $\begin{matrix} x=-1 \\ \Rightarrow \end{matrix} 4 + 9y^2 + z = 0$ Parabola
- $\begin{matrix} x=0 \\ \Rightarrow \end{matrix} 9y^2 + z = 0$ Parabola
- $\begin{matrix} x=1 \\ \Rightarrow \end{matrix} 4 + 9y^2 + z = 0$ Parabola
- $\begin{matrix} x=2 \\ \Rightarrow \end{matrix} 16 + 9y^2 + z = 0$ Parabola



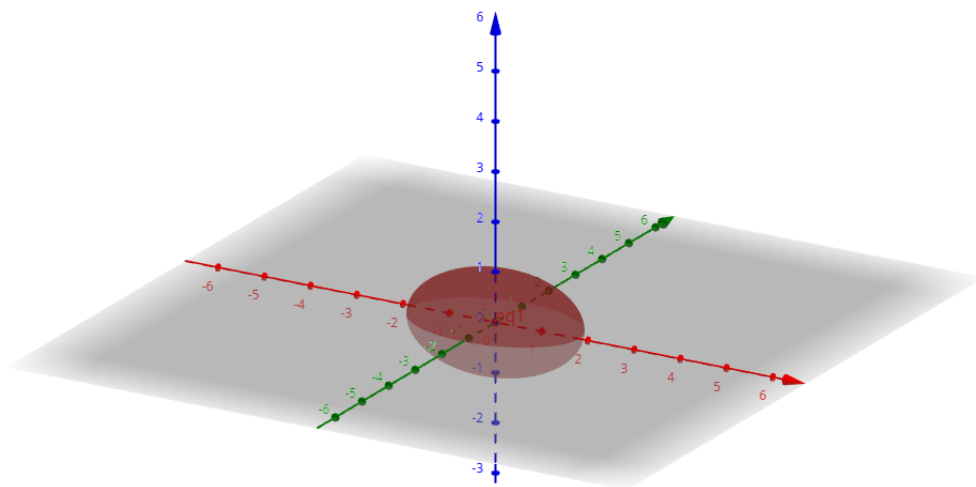
b) 1) $\frac{x^2}{a^2} + \frac{y^2}{b^2} + \frac{z^2}{c^2} = 1$



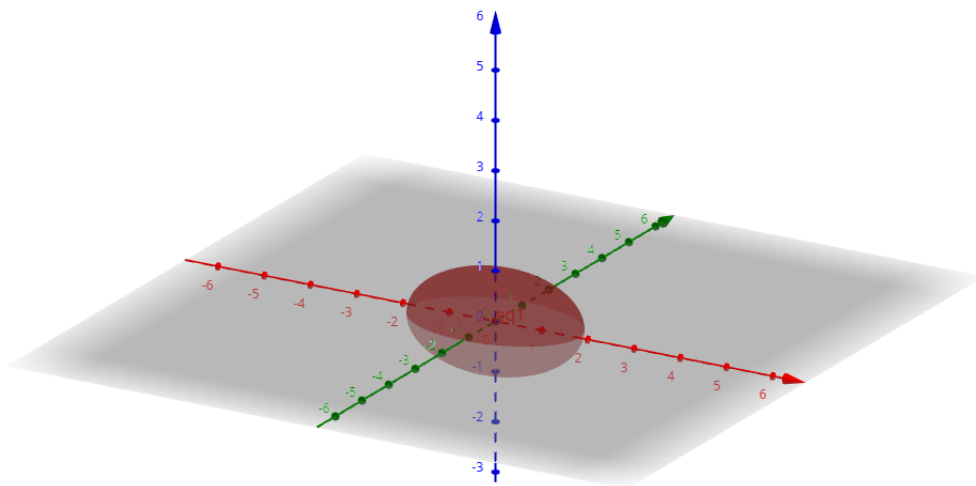
2) $z = \frac{x^2}{a^2} + \frac{y^2}{b^2}$



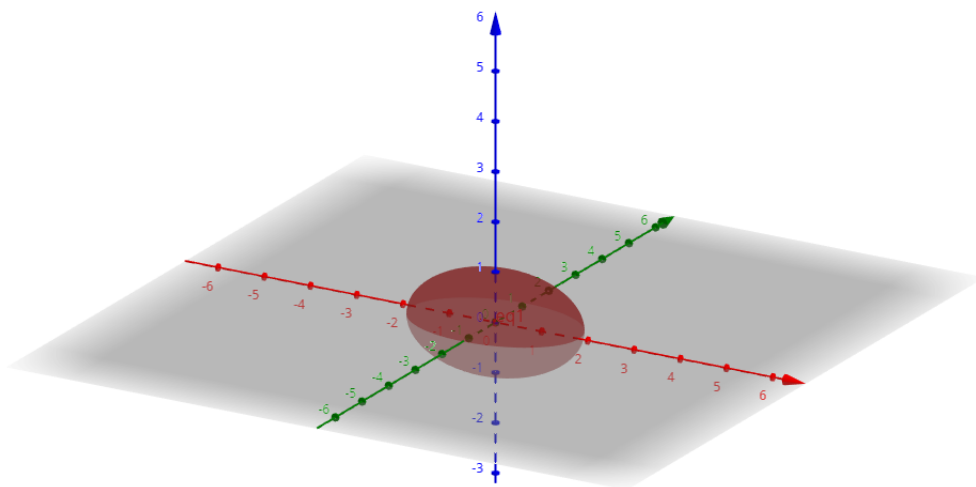
3) $z^2 = \frac{x^2}{a^2} + \frac{y^2}{b^2}$



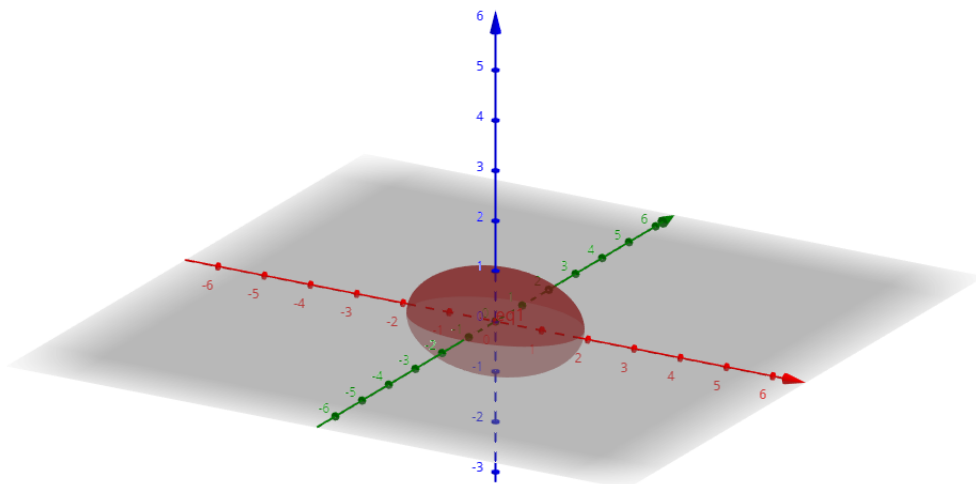
4) $z = \frac{x^2}{a^2} - \frac{y^2}{b^2}$



5) $\frac{x^2}{a^2} + \frac{y^2}{b^2} - \frac{z^2}{c^2} = 1$

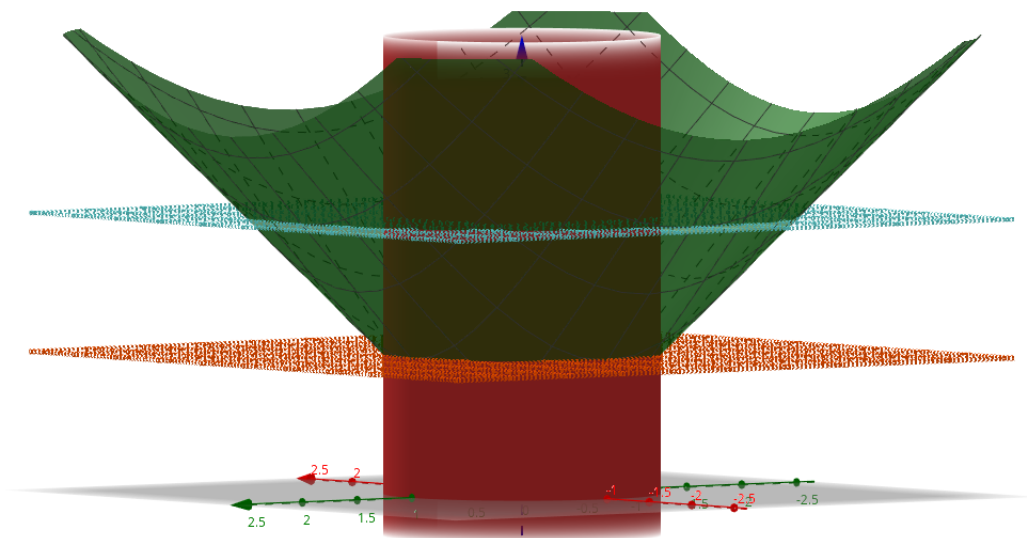


6) $-\frac{x^2}{a^2} - \frac{y^2}{b^2} + \frac{z^2}{c^2} = 1$



8. $x^2 + y^2 = 1$ Un cilindro con centro en $(0,0,0)$

$z = \sqrt{x^2 + y^2}$ z es la distancia entre x e y , un paraboloide



9. a) $r(t) = (\sqrt{4 - t^2}, 5t + 1, \ln(t + 1))$

- $f(t) = \sqrt{4 - t^2}$
 $\Leftrightarrow 4 - t^2 \geq 0 \Leftrightarrow 4 \geq t^2 \Leftrightarrow \sqrt{4} \geq |t| \Leftrightarrow 2 \geq |t| \Leftrightarrow -2 \leq t \leq 2$
 $\Rightarrow f : [-2, 2] \rightarrow \mathbb{R}$
- $g(t) = 5t + 1 \Rightarrow f : \mathbb{R} \rightarrow \mathbb{R}$
- $h(t) = \ln(t + 1)$
 $\Leftrightarrow t + 1 > 0 \Leftrightarrow t > -1$

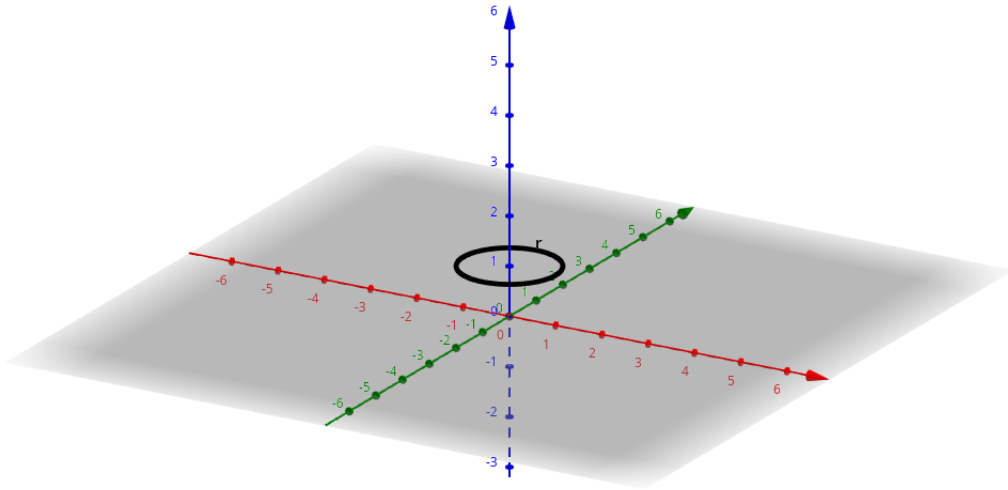
$$\Rightarrow h : [-1, \infty+) \rightarrow \mathbb{R}$$

$$b) r(t) = (4t, \frac{3t}{t-2}, e^t)$$

- $f(t) = 4t \Rightarrow f : \mathbb{R} \rightarrow \mathbb{R}$
- $g(t) = \frac{3t}{t-2} \Rightarrow f : \mathbb{R} - \{2\} \rightarrow \mathbb{R}$
- $h(t) = e^t \Rightarrow \mathbb{R} \rightarrow \mathbb{R}$

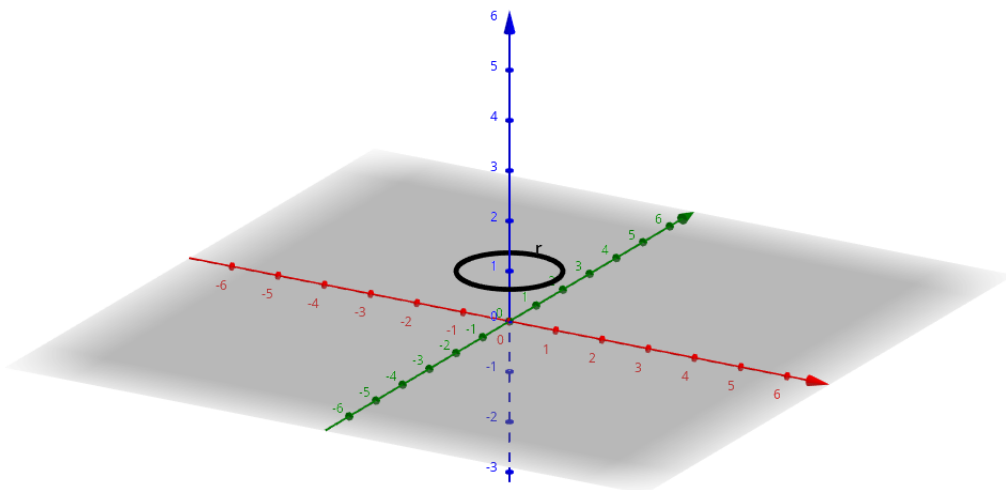
$$10. \quad a) r(t) = (\cos(t), \sin(t), 1)$$

- $f(t) = \cos(t) \Rightarrow f : \mathbb{R} \rightarrow [-1, 1]$
- $g(t) = \sin(t) \Rightarrow f : \mathbb{R} \rightarrow [-1, 1]$
- $h(t) = \cos(t) \Rightarrow f : \mathbb{R} \rightarrow 1$



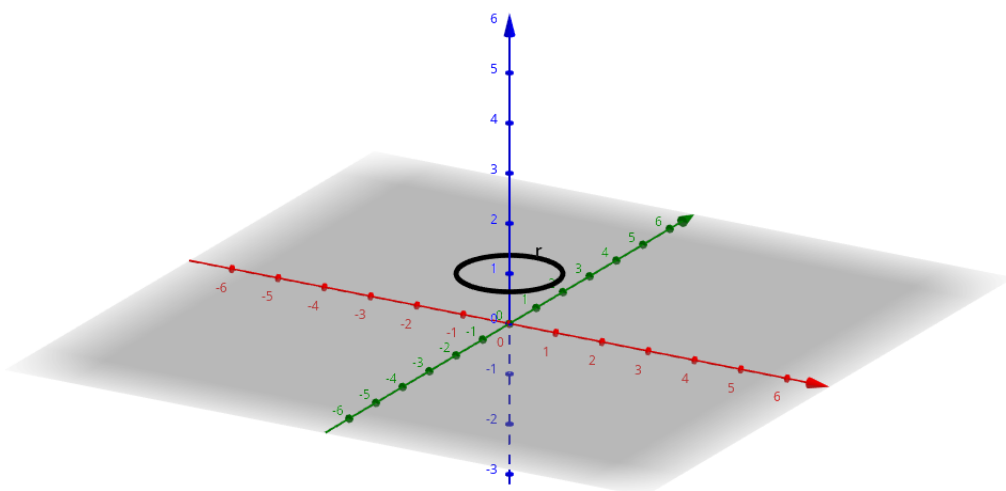
$$b) r(t) = (t, t^2, t - t^2)$$

- $f(t) = t \Rightarrow f : \mathbb{R} \rightarrow [-1, 1]$
- $g(t) = t^2 \Rightarrow f : \mathbb{R} \rightarrow [0, \infty+]$
- $h(t) = t - t^2 \Rightarrow f : \mathbb{R} \rightarrow [\infty-, \frac{1}{4}]$

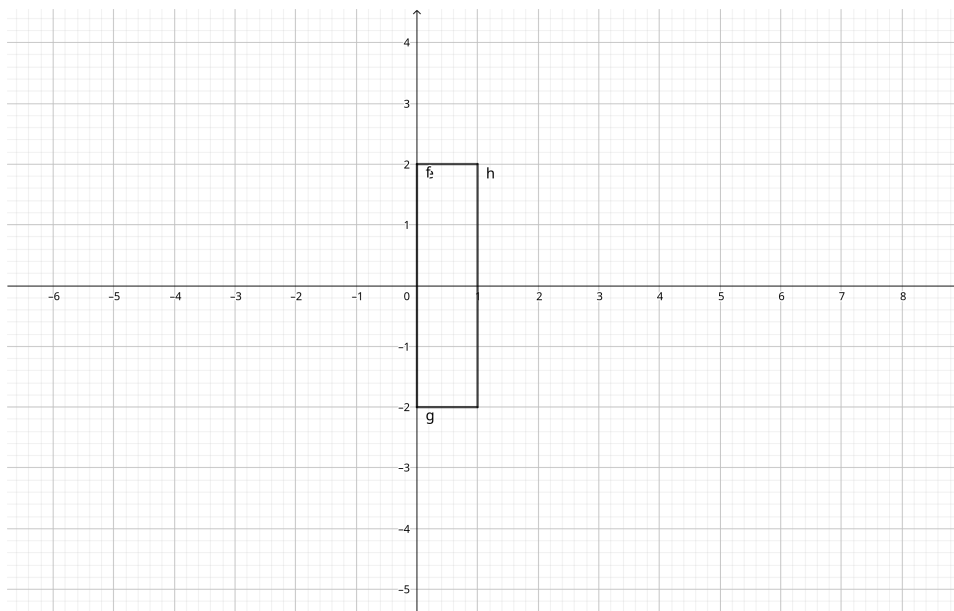


c) $r(t) = (t^2 + t, t^2 - t, (t^2 - t)^2)$

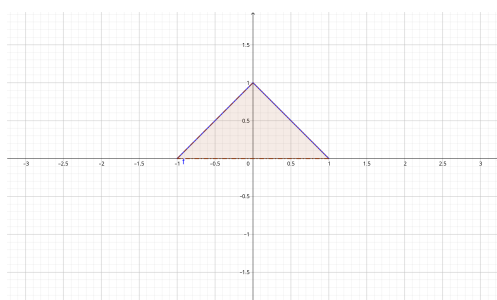
- $f(t) = t^2 + t \Rightarrow f : \mathbb{R} \rightarrow [-\frac{1}{4}, \infty+]$
- $g(t) = t^2 - t \Rightarrow f : \mathbb{R} \rightarrow [-\frac{1}{4}, \infty+]$
- $h(t) = (t^2 - t)^2 \Rightarrow f : \mathbb{R} \rightarrow [0, \infty+]$



11. a)
$$r(t) = \begin{cases} t(0; -4) + (0; 2)t \in [0, 1] \\ (t-1)(1; 0) + (0; 2)t \in (1, 2) \\ (t-2)(1; 0) + (0; -2)t \in [2, 3] \\ (t-3)(0; -4) + (1; 2)t \in [2, 3] \end{cases}$$

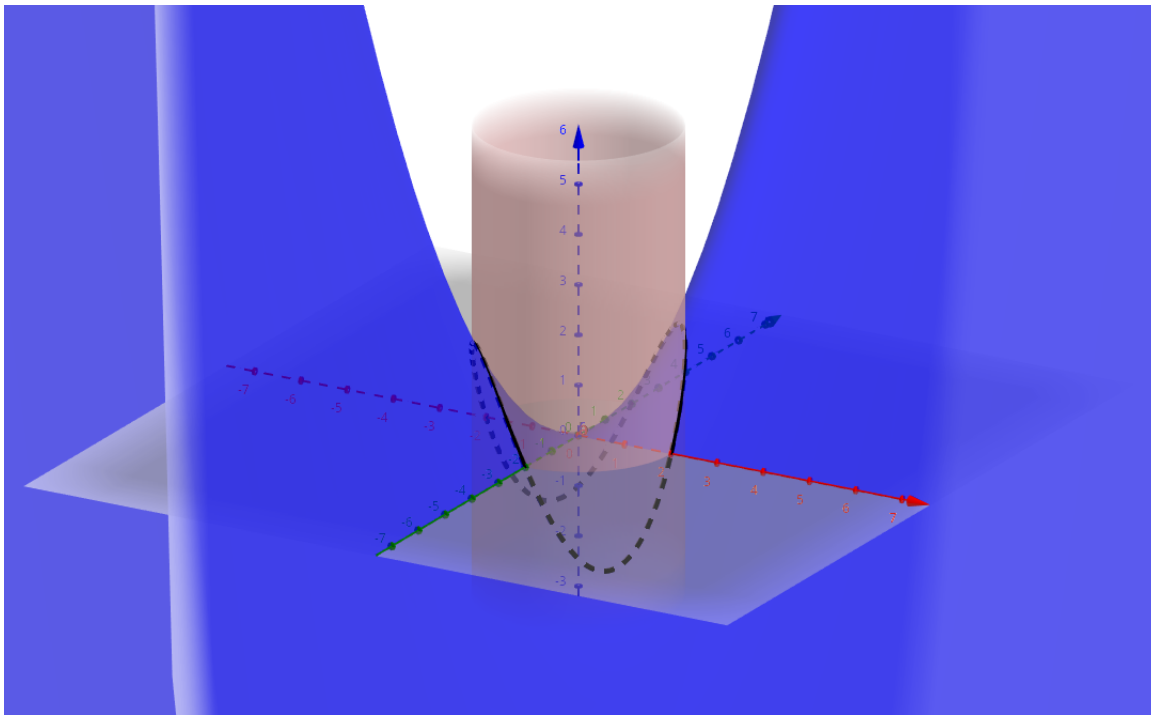


$$b) \quad r(t) = \begin{cases} t(-2; 0) + (1; 0)t \in [0, 1] \\ (t-1)(1; 1) + (-1; 0)t \in (1, 2) \\ (t-2)(1; -1) + (0; 1)t \in [2, 3] \end{cases}$$



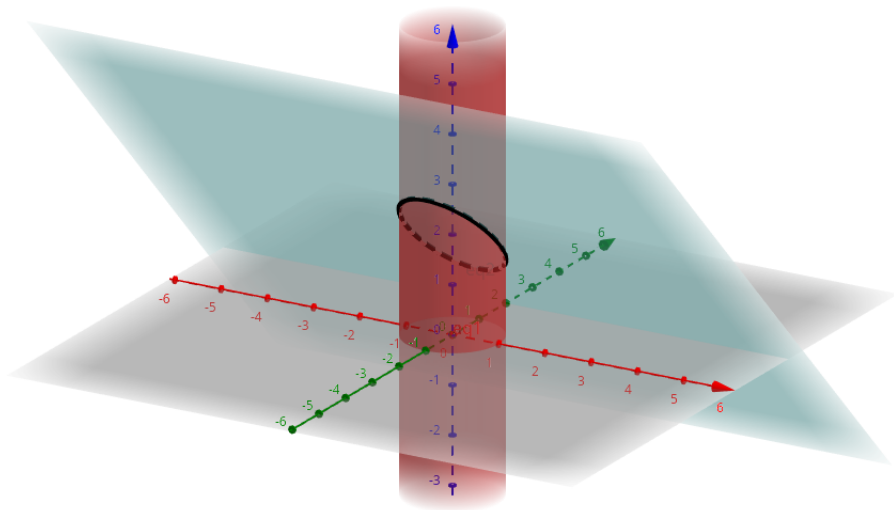
$$12. \quad a) \quad x^2 + y^2 = 4 \wedge z = x \cdot y$$

$$r(t) = \begin{cases} x = 2 \cos(t) \\ y = 2 \sin(t) \\ z = 2 \cos(t) \\ 0 \leq t \leq 2\pi \end{cases}$$



b) $x^2 + y^2 = 1 \wedge y + z = 2$

$$r(t) = \begin{cases} x = \cos(t) \\ y = \sin(t) \\ z = 2 - \sin(t) \\ 0 \leq t \leq 4\pi \end{cases}$$



c) $z = \sqrt{x^2 + y^2} \wedge z = 1 + y$

$$1 + y = \sqrt{x^2 + y^2}$$

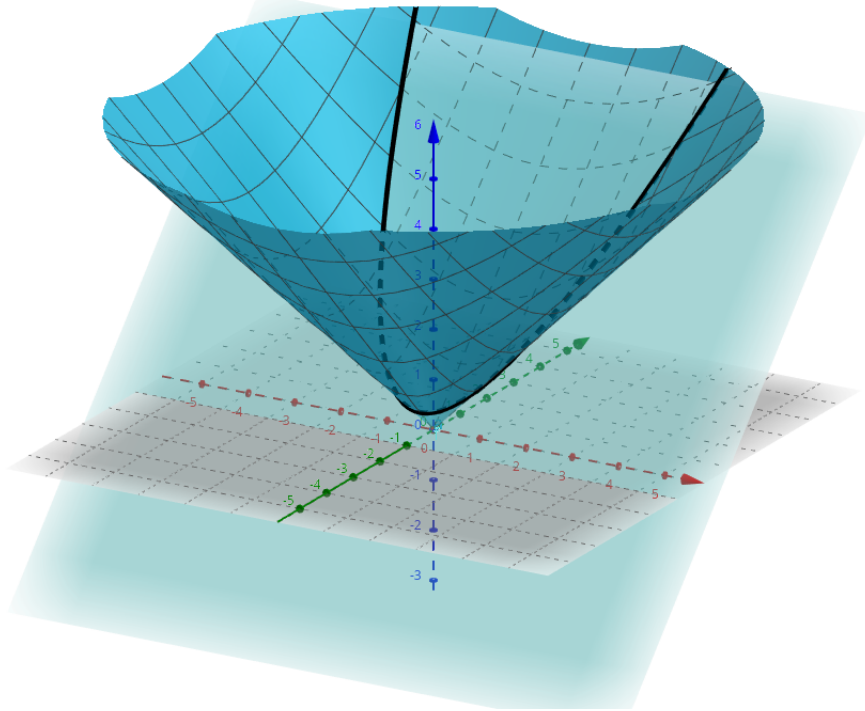
$$(1 + y)^2 = |x^2 + y^2|$$

$$y^2 + 2y + 1 = |x^2 + y^2|$$

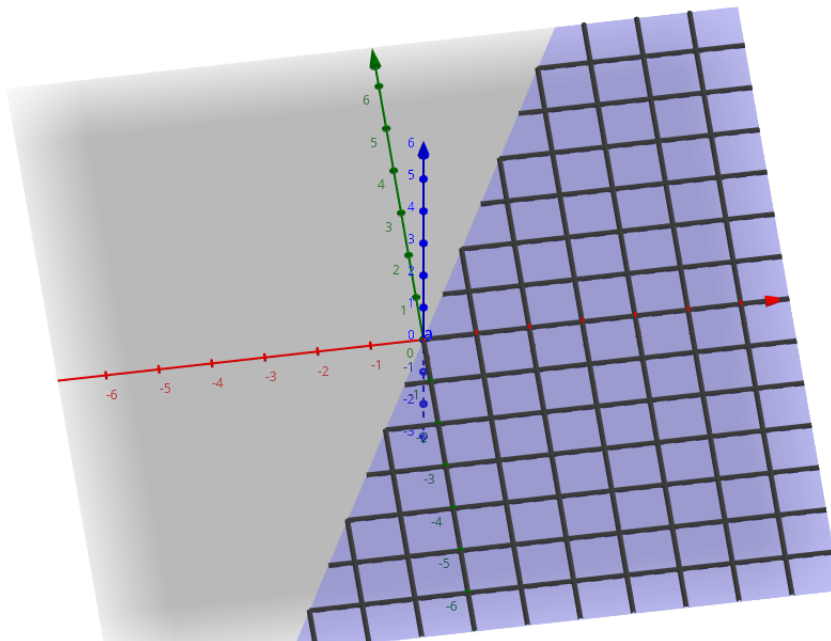
$$y^2 + 2y + 1 = x^2 + y^2$$

$$y = \frac{x^2 - 1}{2}$$

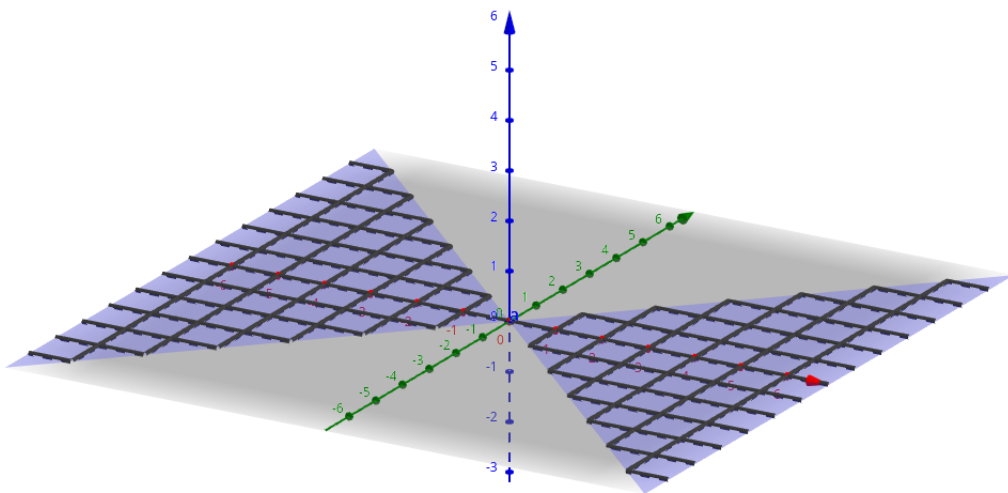
$$r(t) = \begin{cases} x = t \\ y = \frac{t^2-1}{2} \\ z = \frac{t^2-1}{2} + 1 \end{cases}$$



13. a) $f(x, y) = \sqrt{2x - y}$
 $\Leftrightarrow 2x - y \geq 0 \Leftrightarrow x \geq \frac{y}{2}$



b) $f(x, y) = \sqrt{x^2 - y^2}$
 $|x| \geq |y|$



c) $f(x, y, z) = \ln(1 - x^2 - y^2 - z^2)$
 $1 - x^2 - y^2 - z^2 \geq 0$

