

Superficies de Revolución

1 - "Curva de Revolución": Girando un punto en \mathbb{R}^2

2 - Generalización a \mathbb{R}^3

3 - Ejemplos conocidos y no tanto

- Cilindro

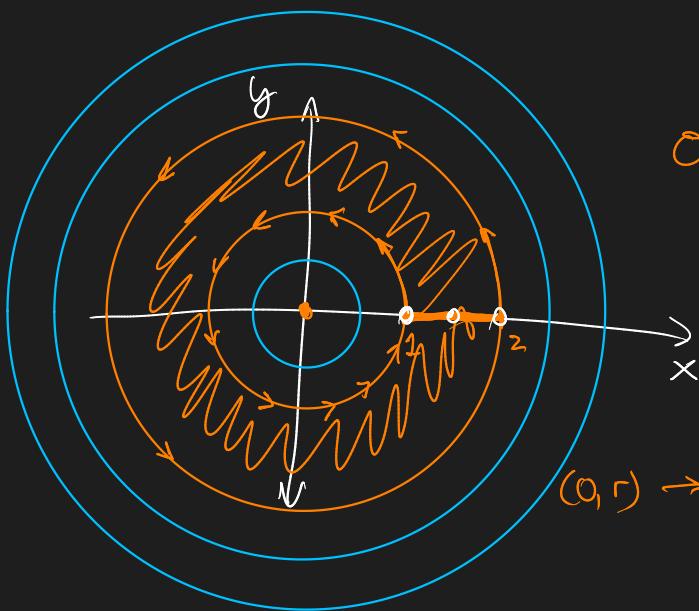
- Cono

- Paraboloides

- Ondas en el agua



* Espiral de Chorro



$$\sigma(r) = (r, 0) \quad r \in [1, 2]$$

⇓ Lo giro alrededor del origen

$$(a, r) \rightarrow (r \sin \theta, r \cos \theta) \quad \theta \in [0, 2\pi)$$

$$(r, 0) \rightarrow (r \cdot \overset{0}{\cos \theta}, r \cdot \overset{1}{\sin \theta})$$

$$\mathbb{R} : r \in [1, 2]$$



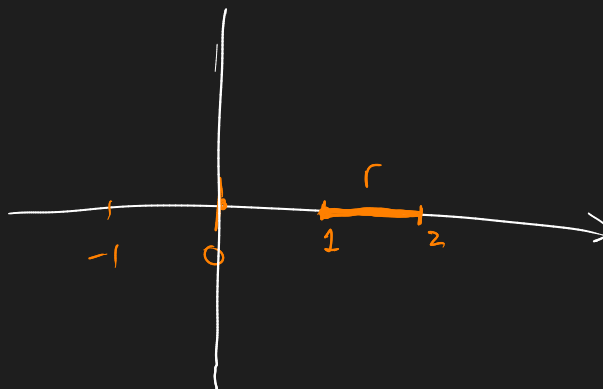
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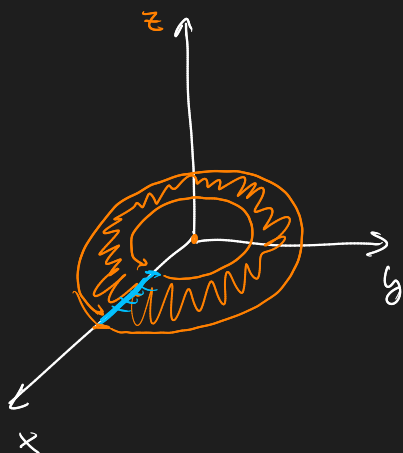
$$\mathbb{R}^2 : (r, 0) \quad x \in [1, 2]$$

↙ ↘

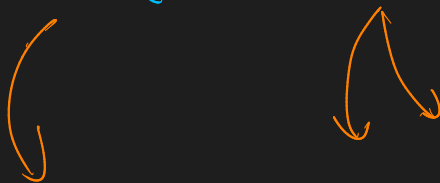
$$(r \cdot \cos \theta, r \cdot \sin \theta)$$



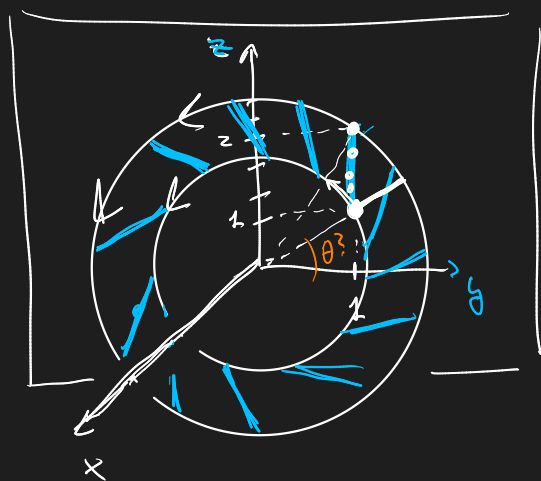
$E \subset \mathbb{R}^3$:



$$\sigma(r) = (r, 0, 0) \quad r \in [1, 2]$$



$$T(r, \theta) = (r \cdot \cos \theta, r \cdot \sin \theta, 0)$$



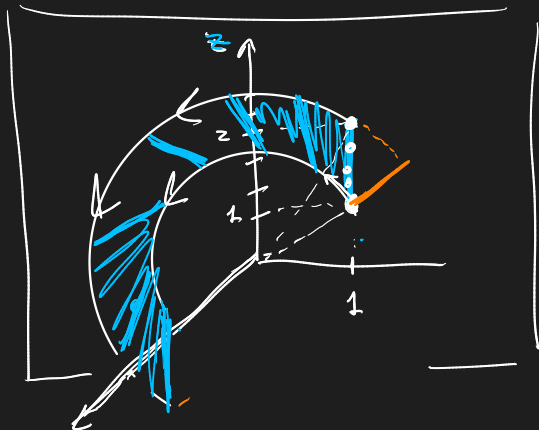
$$(0, 1, z) \quad z \in [1, 2]$$

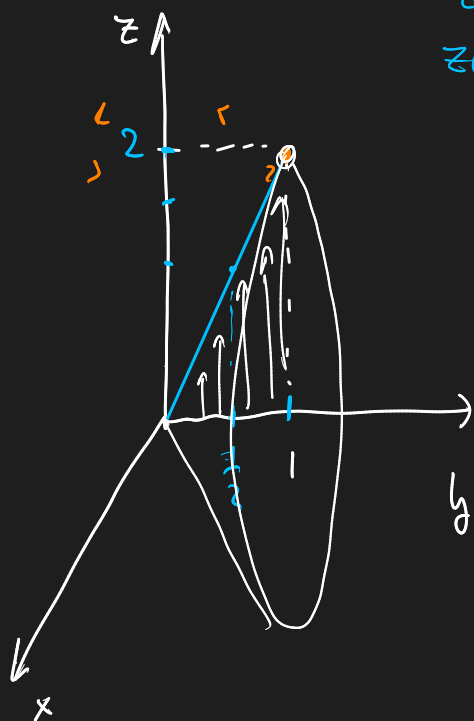


$$\begin{pmatrix} 0 & r \cdot \cos(z) & r \cdot \sin(z) \end{pmatrix}$$

$x \qquad y \qquad z$

$r = ?$



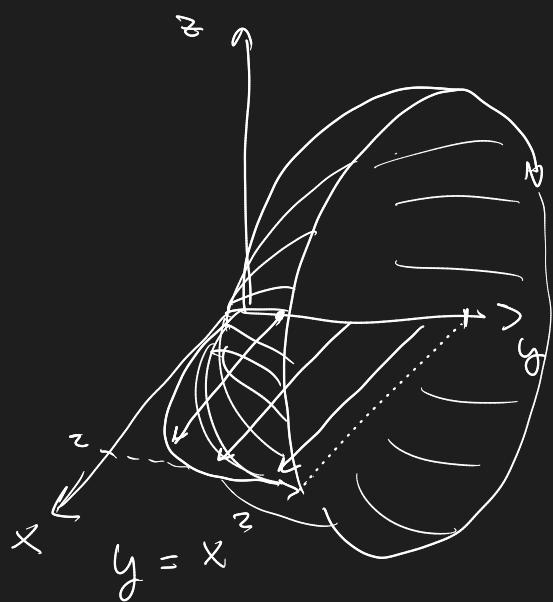


$$z = 2y \quad y \in [0, 1]$$

$$z(y) = 2y$$

$$\sigma(y) = (0, y, 2y) \quad y \in [0, 1]$$

$$(y \sin \theta, y \cos \theta, 2)$$



$$\sigma(x) = (x, x^2, 0) \quad x \in [0, 2]$$

$$T_1(x, \theta) = (x, x^2 \cos \theta, x^2 \sin \theta)$$

$$x \in [0, 2]$$

$$\theta \in [0, 2\pi)$$

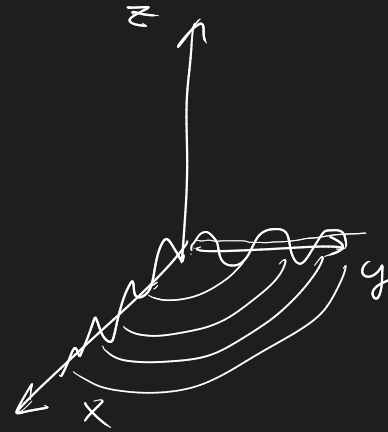
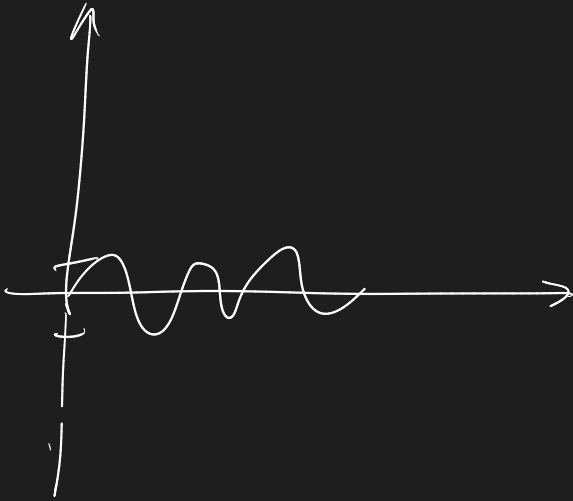
$$|x| = \sqrt{y}$$

$$x \in [0, 2]$$

$$x = \sqrt{y}$$

$$T_2(x, \theta) = (x \cos \theta, x^2, x \sin \theta)$$

- Ondas en el agua



$$z = \sin x \quad x \in [0, 6\pi]$$

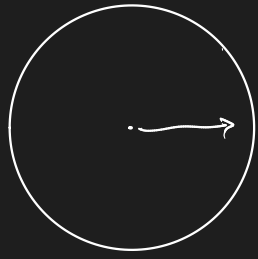
$$\sigma(x) = (x, 0, \sin x)$$

$$T(x, \theta) = (x \cos \theta, x \sin \theta, \sin x)$$

$$x \in [0, 6\pi]$$

$$\theta \in [0, 2\pi)$$

* Espiral de Churro



$$\sigma_1(\theta) = (r \cdot \cos \theta, r \cdot \sin \theta) \quad r \text{ cte}$$

$$r(\theta) = \sin 12\theta$$

$$\sigma_2(\theta) = (\sin(12\theta) \cdot \cos \theta, \sin(12\theta) \cdot \sin \theta)$$

$$\sigma_3(\theta) = ((2 + \sin 12\theta) \cdot \cos \theta, (2 + \sin 12\theta) \cdot \sin \theta)$$

$$T_3(\theta) = ((2 + \sin 12\theta) \cdot \cos \theta, 0, (2 + \sin 12\theta) \cdot \sin \theta)$$

$$T_4(\theta) = (\underbrace{10 + (2 + \sin 12\theta) \cdot \cos \theta}_{\bar{x}}, 0, \underbrace{(2 + \sin 12\theta) \cdot \sin \theta}_{\bar{z}})$$

$$T_5(\theta, \varphi) = (\bar{x} \cdot \cos \theta, \bar{x} \cdot \sin \theta, \bar{z})$$