RETA

$P = A + \underbrace{\lambda}_{\text{parâmetro}} \vec{v}$ → vetor diretor $\neq \vec{0}$

Eq. vetorial reta no espaço

$$(x,y,z) = (x_0, y_0, z_0) + \lambda \underbrace{(a,b,c)}_{\vec{v}}$$

Eqs paramétricas

$$\begin{cases} x = x_0 + \lambda a \\ y = y_0 + \lambda b \\ z = z_0 + \lambda c \end{cases}$$

(x_0, y_0, z_0): ponto A qualquer; (a, b, c): $\vec{v}$

Eqs. simétricas

$$\lambda = \frac{x - x_0}{a} = \frac{y - y_0}{b} = \frac{z - z_0}{c}$$

Eq. reduzidas

$$\begin{cases} y = mx + n \\ z = px + q \end{cases}$$

Duas RETAS ⇒ $\vec{v}$ de r e $\vec{u}$ de s forem //

r = s — **COINCIDENTES ou PARALELAS**

$\vec{v}$ diretor de r

$\vec{u}$ diretor de s

$\vec{v}$ de r e $\vec{u}$ de s não // — **CONCORRENTES ou REVERSAS**

ângulo entre duas retas

$$\boxed{\cos\theta = \frac{|v_1 \cdot v_2|}{\|\vec{v_1}\| \cdot \|\vec{v_2}\|}}$$

$\theta \geq 0$ e $\theta \leq \frac{\pi}{2}$ (90°)

PLANOS

Eq vetorial

$$(x,y,z) = (x_0, y_0, z_0) + \underbrace{\lambda}_{\text{parâmetro}}(a,b,c) + \underbrace{\mu}_{\text{parâmetro}}(a_1, b_1, c_1)$$

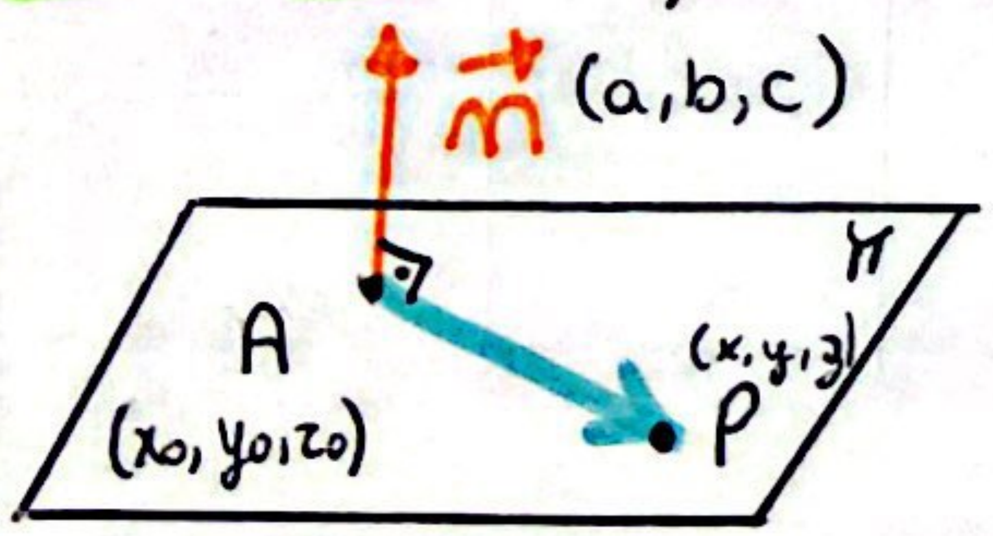
$$P = A + \lambda\vec{u} + \mu\vec{v}$$

Eq. paramétricas

$$\begin{cases} x = x_0 + \lambda a + \mu a_1 \\ y = y_0 + \lambda b + \mu b_1 \\ z = z_0 + \lambda c + \mu c_1 \end{cases}$$

$A(x_0, y_0, z_0)$ PONTO QUALQUER

EQUAÇÃO GERAL de um plano



$\vec{AP} \cdot \vec{m} = 0$

$$ax + by + cz + d = 0$$

Ângulo entre reta e plano no espaço

$$\text{sen}(\theta) = \frac{|\vec{v} \cdot \vec{m}|}{\|\vec{v}\| \cdot \|\vec{m}\|}$$

$\theta \geq 0$ e $\theta \leq 90° = \frac{\pi}{2}$

Ângulo entre dois planos no espaço

$$\cos(\theta) = \frac{|\vec{m_1} \cdot \vec{m_2}|}{\|\vec{m_1}\| \cdot \|\vec{m_2}\|}$$

$\theta \geq 0$ e $\theta \leq \frac{\pi}{2} = 90°$

A, B, C não colineares formam △

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PARÁBOLA

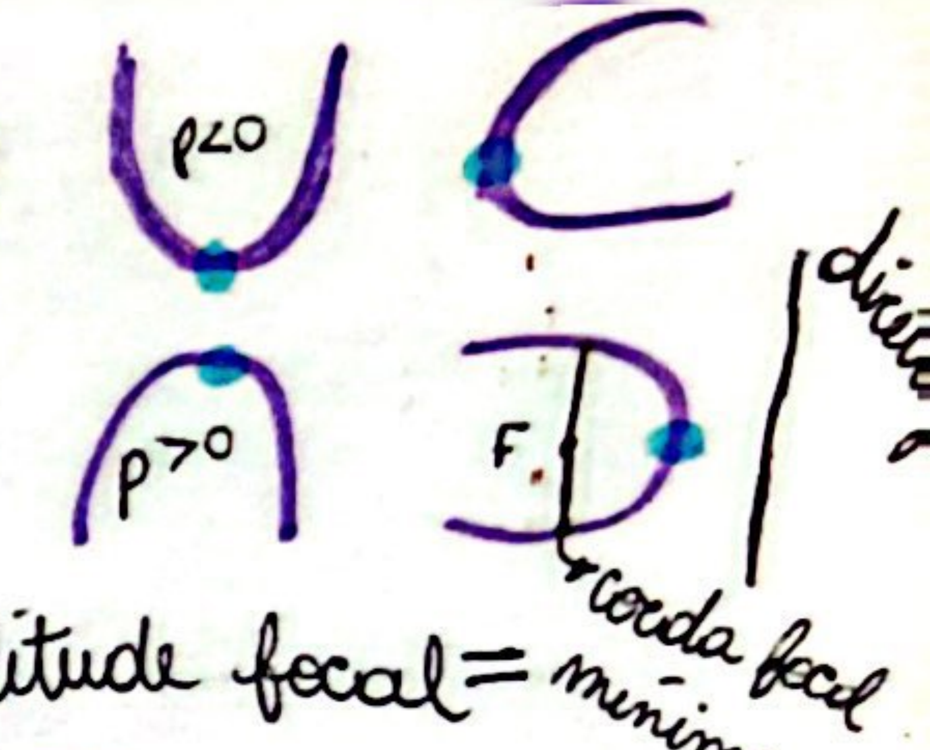
$f(x) = y = ax^2+bx+c$ $\quad V\left(\frac{-b}{2a}, \frac{-\Delta}{4a}\right)$ $\quad (x-x_0)^2 = 4p(y-y_0)$ $\Big\}$ $a>0$

$\boxed{\text{FOCO}}(x_0, y_0+p)$ $\quad V(x_0, y_0)$ $\quad$ EQ. REDUZIDA

$\Delta>0 \quad \Delta=0 \quad \Delta<0$

2 raízes $\quad$ 1 raiz $\quad$ ∄ raiz

$f(y) = x = ay^2+by+c$ $\quad V\left(\frac{-\Delta}{4a}, \frac{-b}{2a}\right)$ $\quad (y-y_0)^2 = 4p(x-x_0)$ $\Big\}$ $a<0$

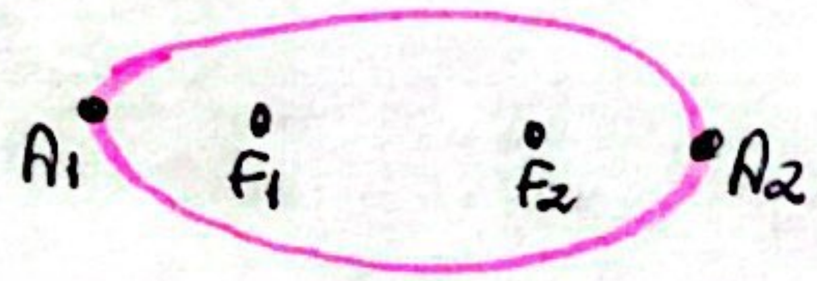


amplitude focal $cc' = 4|p|$ $\qquad e=1$

amplitude focal = corda focal mínima

ELIPSE

$\frac{(x-x_0)^2}{a^2} + \frac{(y-y_0)^2}{b^2} = 1$



$\frac{(x-x_0)^2}{b^2} + \frac{(y-y_0)^2}{a^2} = 1$

$e = \frac{c}{a}$

amp. focal

$cc' = \frac{2b^2}{a}$

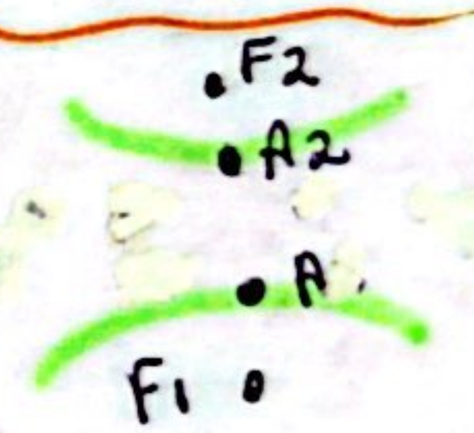
$e<1$

HIPÉRBOLE

$\frac{(x-x_0)^2}{a^2} - \frac{(y-y_0)^2}{b^2} = 1$

$e>1$

$\frac{(y-y_0)^2}{a^2} - \frac{(x-x_0)^2}{b^2} = 1$



$cc' = \frac{2b^2}{a}$

Usar completamento de quadrados em equações gerais $Ax^2+Bxy+Cy^2+Dx+Ey+F=0$

CIRCUNFERÊNCIA

$(x-x_0)^2+(y-y_0)^2=r^2$

4 superfície esfera

parabolóide hiperbólico

cela de cavalo

$\frac{x-x_0}{a} = \frac{-(y-y_0)^2}{b^2} + \frac{(z-z_0)^2}{c^2}$

negativo

elipsóide

$\frac{(x-x_0)^2}{a^2} + \frac{(y-y_0)^2}{b^2} + \frac{(z-z_0)^2}{c^2} = 1$

= Hiperbolóide de uma folha

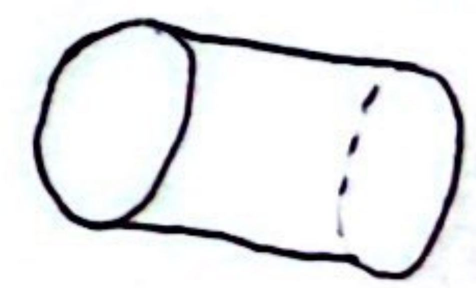
um sinal negativo

= Hiperbolóide de duas folhas

dois sinais negativos

// ao eixo sinal +

cilindro elíptico



cilindro de revolução

parabolóide

$\frac{x-x_0}{a} = \frac{(y-y_0)^2}{b^2} + \frac{(z-z_0)^2}{c^2}$

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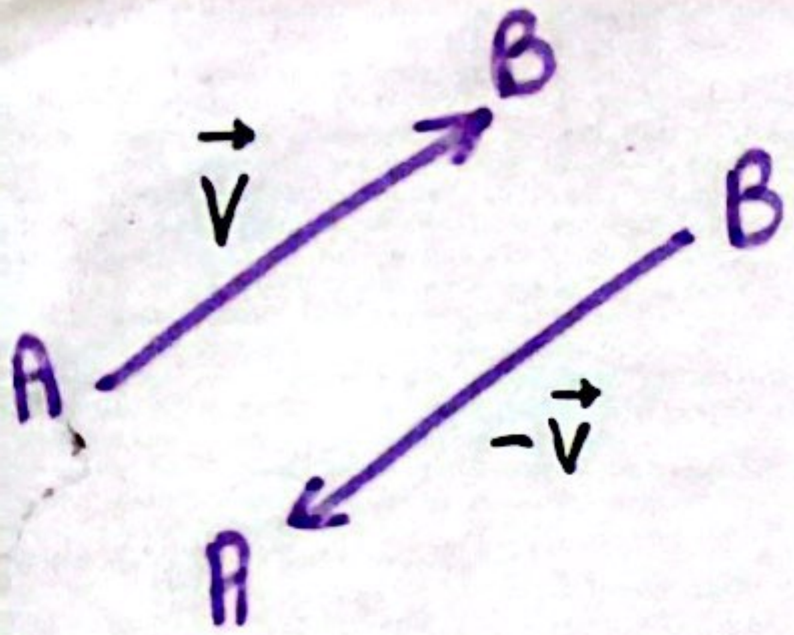
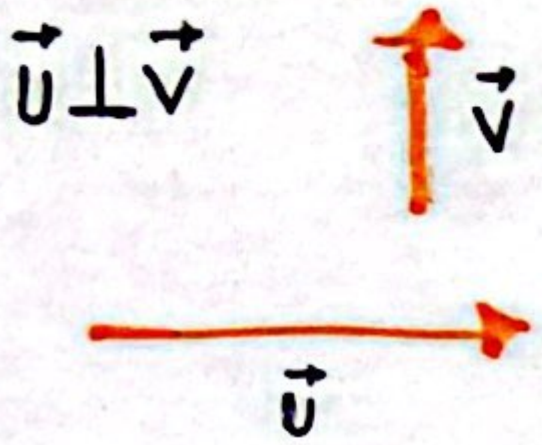
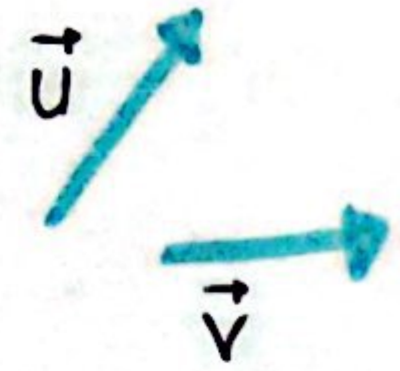
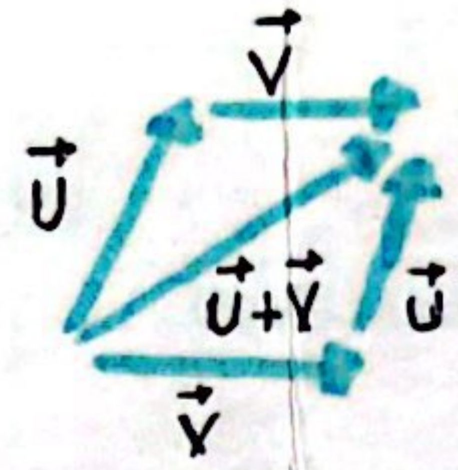
VETORES & COORDENADAS CARTESIANAS



$\vec{u} \perp \vec{v}$







$\vec{u} // \vec{v} \rightarrow \vec{u} = \alpha \vec{v}$

PARALELISMO
PROPORCIONALIDADE

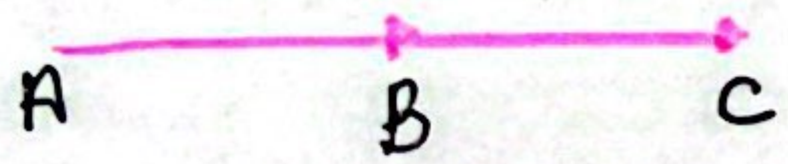
Versor

$\boxed{\dfrac{\vec{v}}{\|\vec{v}\|}}$

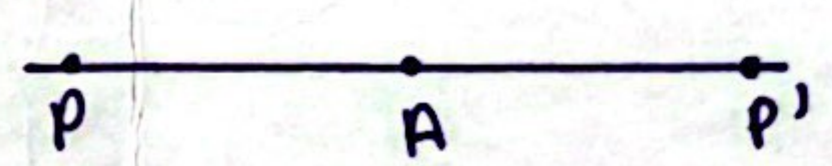
$\vec{u} = \vec{PQ} = Q - P$

colinearee - mesma reta

A, B, C $\Rightarrow \vec{AB} = \alpha \vec{AC}$



PONTO SIMÉTRICO



$\vec{u} + \vec{v} = (x_1 + x_2, y_1 + y_2, z_1 + z_2)$

$\|\vec{v}\| = \sqrt{x^2 + y^2 + z^2}$

PRODUTO escalar

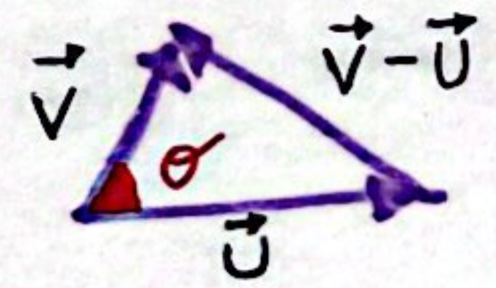
número $\in \mathbb{R}$

$\Uparrow$

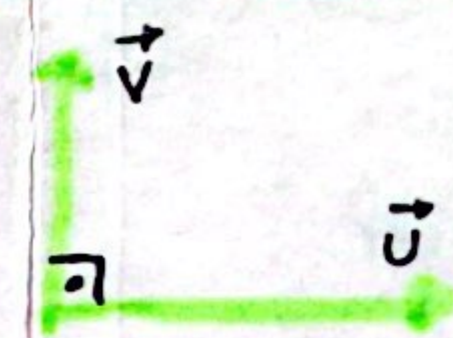
$\vec{u} \cdot \vec{v} = x_1 x_2 + y_1 y_2 + z_1 z_2$

$\alpha(\vec{u} \cdot \vec{v}) = (\alpha \vec{u}) \cdot \vec{v} = \vec{u} \cdot (\alpha \vec{v})$

ÂNGULO θ ENTRE VETORES



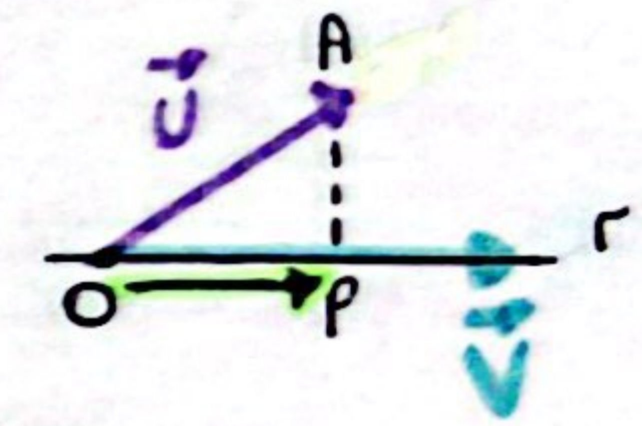
$\vec{u} \cdot \vec{v} = \|\vec{u}\| \cdot \|\vec{v}\| \cdot \cos(\theta)$



$\vec{u} \perp \vec{v} \leftrightarrow \vec{u} \cdot \vec{v} = 0$

$\vec{u} \cdot \vec{v} = \|\vec{u}\|^2$

VETOR PROJEÇÃO ORTOGONAL



$\text{proj}_{\vec{v}} \vec{u} = \dfrac{\vec{u} \cdot \vec{v}}{\|\vec{v}\|^2} \vec{v} \Rightarrow$ Vetor

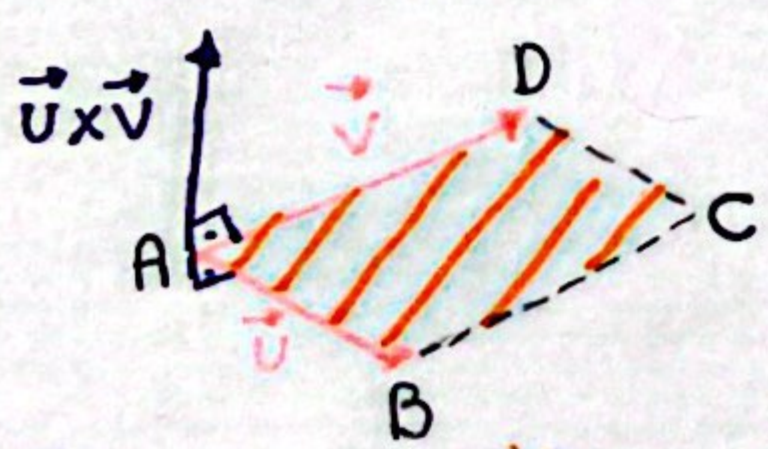
PRODUTO vetorial

vetor

$\Uparrow$

$\vec{w} \cdot (\vec{u} \times \vec{v}) = (\vec{w} \times \vec{u}) \cdot \vec{v}$

$\vec{u} \times \vec{v} = \det \begin{bmatrix} \vec{i} & \vec{j} & \vec{k} \\ x_1 & y_1 & z_1 \\ x_2 & y_2 & z_2 \end{bmatrix}$



$A(ABCD) = \|\vec{u} \times \vec{v}\|$

$\|\vec{u} \times \vec{v}\| = \|\vec{u}\| \cdot \|\vec{v}\| \cdot sen(\theta)$

medida θ entre $\vec{u}$ e $\vec{v}$

$\alpha(\vec{u} \times \vec{v}) = (\alpha \vec{u}) \times \vec{v} = \vec{u} \times (\alpha \vec{v})$

PRODUTO misto

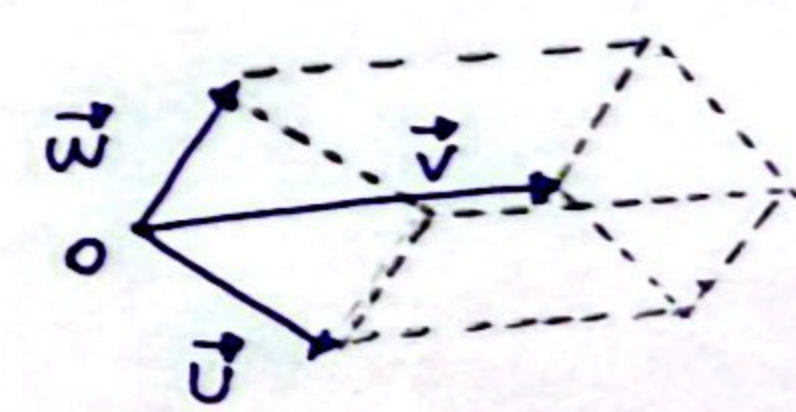
número $\in \mathbb{R}$

$\vec{u} \cdot \vec{v} \times \vec{w} =$

$\det \begin{bmatrix} x_1 & y_1 & z_1 \\ x_2 & y_2 & z_2 \\ x_3 & y_3 & z_3 \end{bmatrix}$

VOLUME

$V = |\vec{u} \cdot \vec{v} \times \vec{w}|$

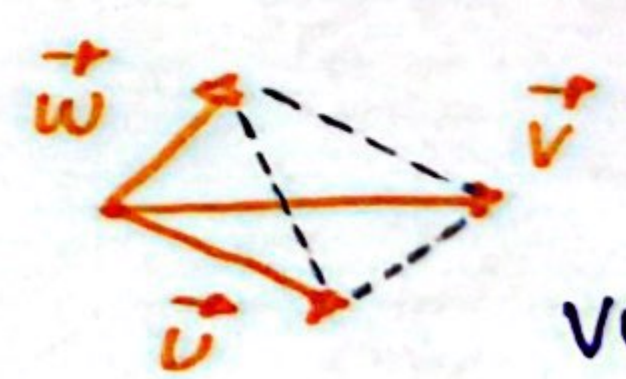


A, B, C, D

COPLANARES

$\vec{AB} \cdot \vec{AC} \times \vec{AD} = 0$

mesma origem



$V = \dfrac{|\vec{u} \cdot \vec{v} \times \vec{w}|}{6}$

VOLUME TETRAEDRO

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