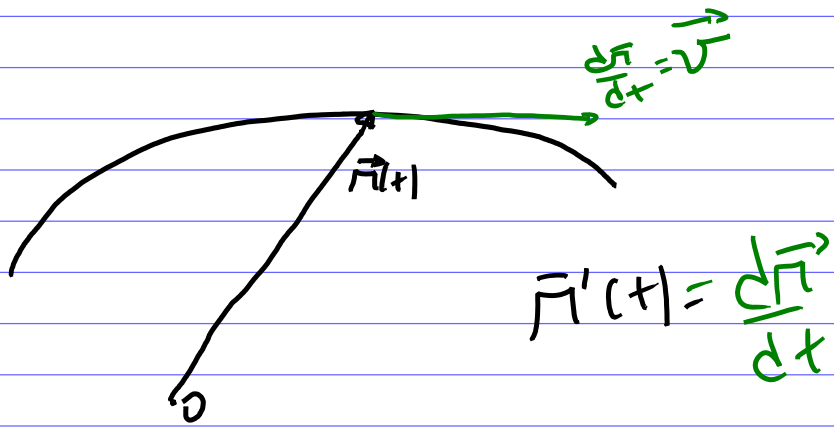
$$\vec{r}(t) = \langle \cos t, \operatorname{sen} t, t \rangle$$



$$\vec{r}\,'(t) = \frac{d\vec{r}}{dt}$$

$$\vec{T} = \frac{\frac{d\vec{r}}{dt}}{\left|\frac{d\vec{r}}{dt}\right|} = \frac{\vec{v}}{|\vec{v}|}$$

Vetor tangente unitário.

Exacíco

Calcule o vetor tagente unitário.

$$\vec{r}(t) = \langle t, t^2, 2 \rangle$$

x y

$x = t$, $y = t^2$ $\Rightarrow$ $y = x^2$

Eq. Paramétrica: $x = 1$, $y = 2t$, $z = 0$

Eq. vetorial.

$$\vec{r}\,'(t) = \langle 1, 2t, 0 \rangle$$

$$|\vec{r}\,'(t)| = \sqrt{1^2 + (2t)^2 + 0^2}$$

$$= \sqrt{1 + 4t^2}$$

$$\vec{T} = \frac{\vec{r}\,'(t)}{|\vec{r}\,'(t)|} = \frac{\vec{r}\,'}{|\vec{r}\,'|} = \frac{\langle 1, 2t, 0 \rangle}{\sqrt{1 + 4t^2}}$$

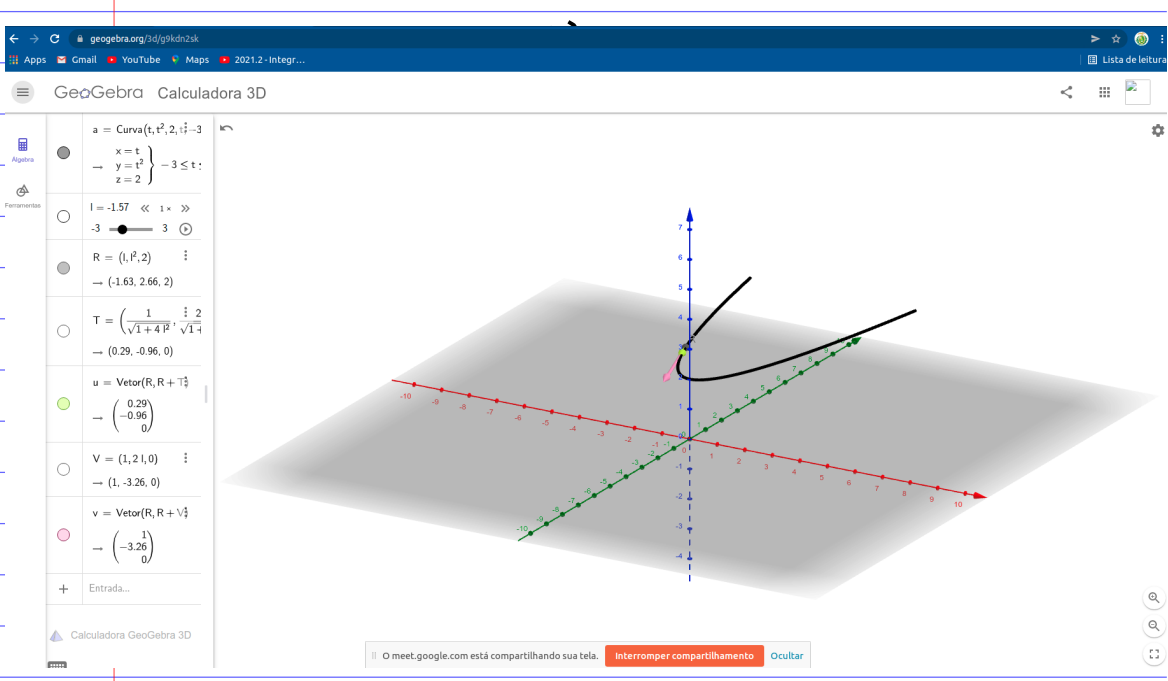
NÃ£o precisamos indicar o tempo todo que r Ã© funÃ§Ã£o de t

No geogebra, Vetor(P_{in}, P_{fin})

Veta($\vec{r}(t)$, $\vec{r}(t) + \vec{T}$)

InstruÃ§Ã£o para desenhar o vetor tangente unitÃ¡rio T na curva deixada por r(t)

https://www.geogebra.org/3d/g9kdn2sk



21. Se $\mathbf{r}(t) = \langle t, t^2, t^3 \rangle$, encontre $\mathbf{r}'(t)$, $\mathbf{T}(1)$, $\mathbf{r}''(t)$ e $\mathbf{r}'(t) \times \mathbf{r}''(t)$.

$\vec{r}(t) = \langle t, t^2, t^3 \rangle$ Posição

$\vec{r}'(t) = \langle 1, 2t, 3t^2 \rangle$ velocidade

$$\vec{T}(1) = \frac{\vec{r}'(1)}{|\vec{r}'(1)|} = \frac{\langle 1,2,3 \rangle}{\sqrt{1+4+9}}$$

$$\vec{T}(1) = \frac{\langle 1,2,3 \rangle}{\sqrt{14}}$$

$\vec{r}''(t) = \langle 0, 2, 6t \rangle$ Aceleração

$$\vec{r}' \times \vec{r}'' = \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ 1 & 2t & 3t^2 \\ 0 & 2 & 6t \end{vmatrix} \begin{matrix} \hat{i} & \hat{j} \\ 1 & 2t \\ 0 & 2 \end{matrix}$$

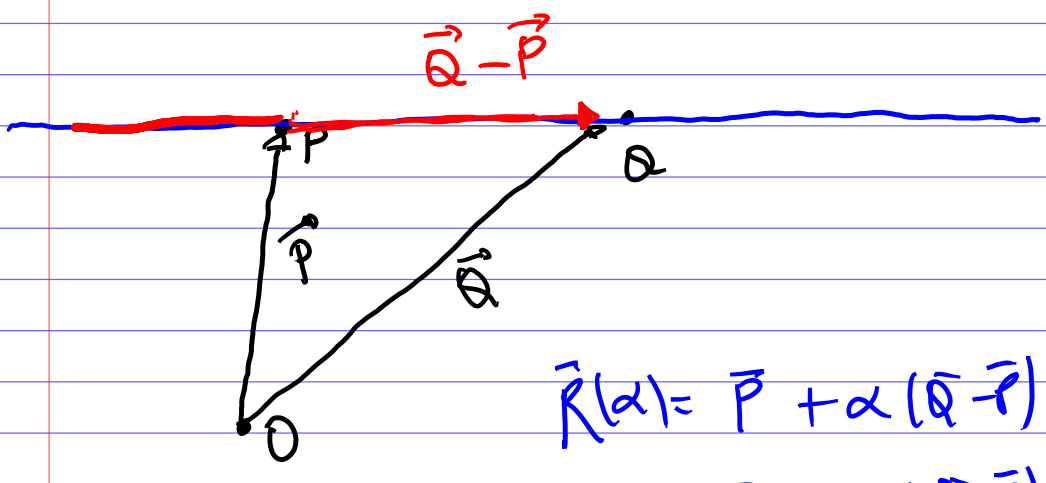
$$= 0\hat{k} - 6t^2\hat{i} - 6t\hat{j} + 12t^2\hat{i} + 0\hat{j} + 2\hat{k}$$

$$\vec{r}' \times \vec{r}'' = 6t^2\hat{i} - 6t\hat{j} + 2\hat{k}$$

17–20 Encontre uma equação vetorial e equações paramétricas para o segmento de reta que liga P e Q.

17. $P(0, 0, 0)$, $Q(1, 2, 3)$ **18.** $P(1, 0, 1)$, $Q(2, 3, 1)$

$$\vec{R}(t) = \vec{P} + t(\vec{Q} - \vec{P})$$



$$\vec{R}(\alpha) = \vec{P} + \alpha(\vec{Q} - \vec{P})$$

$$R(t) = \vec{P} + \alpha(\vec{Q} - \vec{P})$$

$P(0,0,0)$ $Q(1,2,3)$	$P(1,0,1)$ $Q(2,3,1)$

a) $\vec{R}(\alpha) = \langle 0,0,0\rangle + \alpha(\langle 1,2,3\rangle - \langle 0,0,0\rangle)$

$R(\alpha) = \alpha\langle 1,2,3\rangle$

Eq. vetorial

$x = \alpha$
$y = 2\alpha$
$z = 2\alpha$

Eq. Paramétricas

b) $R(\alpha) = \langle 1,0,1\rangle + \alpha(\langle 2,3,1\rangle - \langle 1,0,1\rangle)$

$\vec{R}(\alpha) = \langle 1,0,1\rangle + \alpha(\langle 1,3,0\rangle)$

$R(\alpha) = \langle 1+\alpha, 3\alpha, 1\rangle$

Eq. vetorial

$x = 1+\alpha$
$y = 3\alpha$
$z = 1$

Eq. Paramétricas

https://www.geogebra.org/3d/zq78zxdf