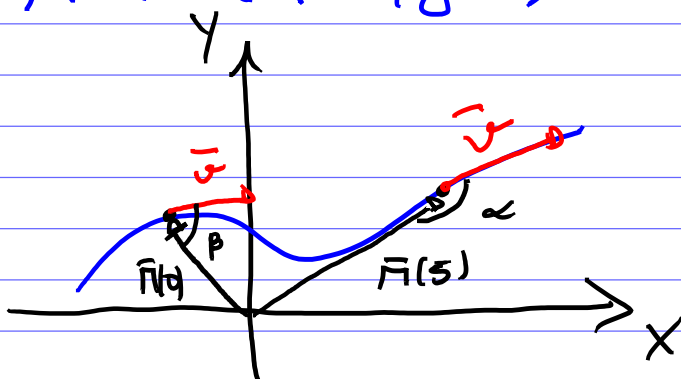
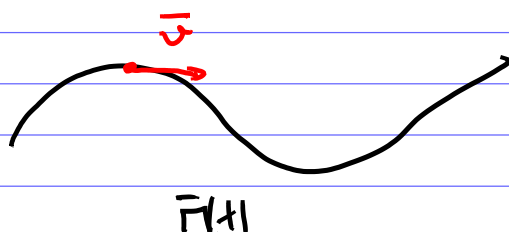


$$\vec{r}(t) = \langle f(t), g(t) \rangle$$



$$\left. \frac{d\vec{r}(t)}{dt} \right|_{t-} = \vec{v}(t)$$



$$\frac{d\vec{v}}{dt} = \vec{a}$$

— // —

\vec{T} vetor tangente unitário

$$\vec{T} = \frac{\vec{v}}{|\vec{v}|} = \frac{\vec{r}'}{|\vec{r}'|}$$

Exemplo:

1. Calcule $\vec{T}(t)$, $\vec{T}(1)$ e $\vec{T}(0)$

$$\text{Pro } \vec{r}(t) = \langle t, 1, \frac{t^2}{2} \rangle$$

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

$$\vec{T}(t) = \frac{\langle 1, 0, t \rangle}{\sqrt{1^2 + 0^2 + t^2}}$$

$$\text{Lembre-se: } |\langle a, b, c \rangle| = \sqrt{a^2 + b^2 + c^2}$$

$$\vec{T}(t) = \frac{1}{\sqrt{1+t^2}} \cdot \langle 1, 0, t \rangle$$

$$\vec{T}(t) = \frac{1}{\sqrt{1+t^2}} (\hat{i} + t\hat{k})$$

Outra
notação!

$$\vec{T}(0) = \frac{1}{\sqrt{1+0}} (\hat{i} + 0\hat{k}) = \hat{i}$$

$$\vec{T}(0) = \langle 1, 0, 0 \rangle$$

$$\vec{T}(1) = \frac{1}{\sqrt{2}} (\hat{i} + 1\hat{k})$$

$$\vec{T}(1) = \frac{1}{\sqrt{2}} \langle 1, 0, 1 \rangle$$

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

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

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

$$\vec{T}(1) = \frac{\vec{r}'(1)}{|\vec{r}'(1)|} = \frac{\langle 1, 2, 3 \rangle}{\sqrt{1+4+9}} = \frac{\langle 1, 2, 3 \rangle}{\sqrt{14}}$$

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

$$\begin{aligned} \vec{r}'(t) \times \vec{r}''(t) &= \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ 1 & 2t & 3t^2 \\ 0 & 2 & 6t \end{vmatrix} = \hat{i}(12t^2 - 6t^3) - \hat{j}(6t) + \hat{k}(2) \\ &= \langle 6t^2, -6t, 2 \rangle \end{aligned}$$

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

Eq. Paramétrica

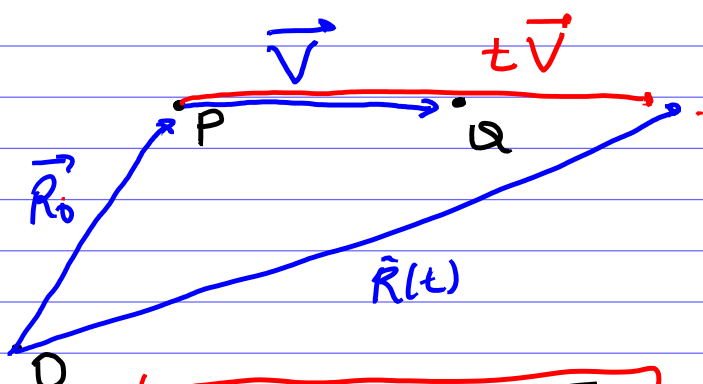
$$x = t$$

$$y = t^2$$

$$z = \cos t$$

Eq. vetorial

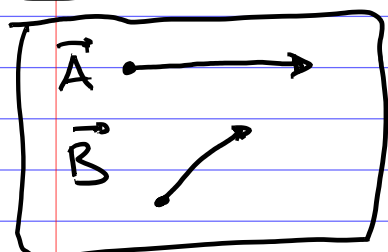
$$\vec{r}(t) = \langle t, t^2, \cos t \rangle$$



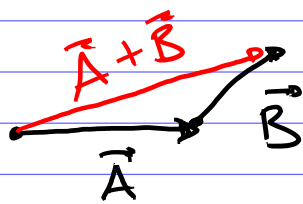
$$\vec{R}(t) = \vec{R}_0 + t\vec{V}$$

Eq. vetorial de reta

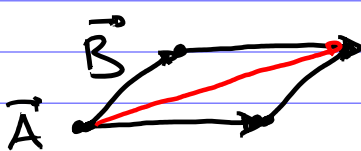
Lembrando
Soma de vetores



Modo 1



Modo 2



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

$$\vec{R}(t) = \vec{R}_0 + t\vec{V}$$

Eq. vetorial de reta

$$\vec{R}_0 = \langle 1, 0, 1 \rangle$$

$$\vec{V} = \langle 2, 3, 1 \rangle - \langle 1, 0, 1 \rangle$$

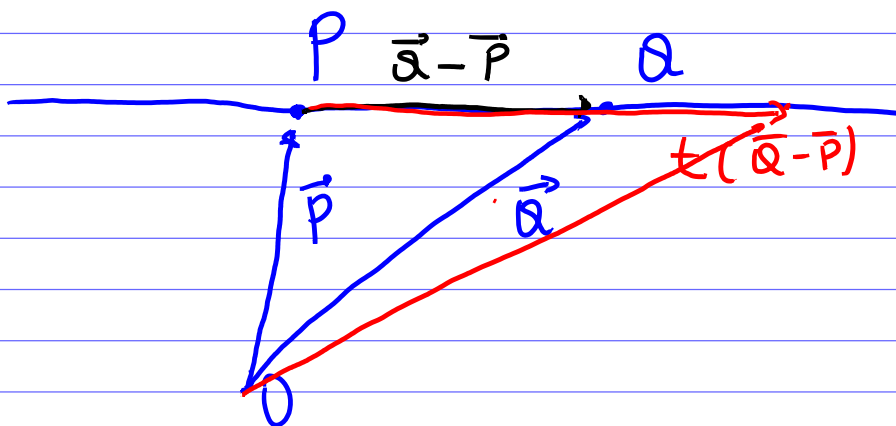
$$\vec{V} = \langle 1, 3, 0 \rangle$$

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

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

Curva $(1+t, 3t, 1, t, -10, 10)$

↑ ↑ ↑
Paramétrico Início Fim



$$\bar{R}(t) = \bar{p} + t(\bar{q} - \bar{p})$$

$$p/t=0 \quad \bar{R}(0) = \bar{p}$$

$$p/t=1 \quad \bar{R}(1) = \bar{q}$$