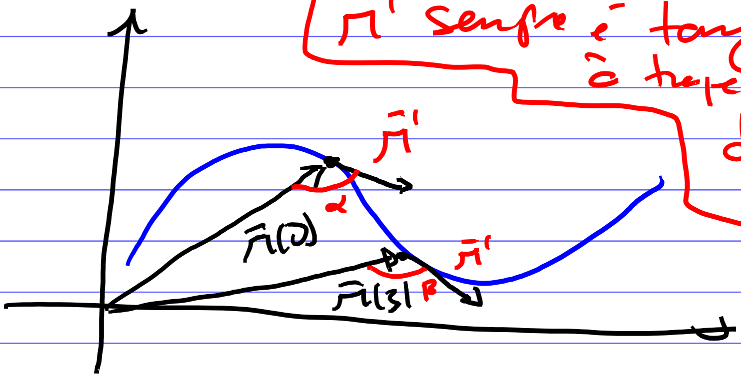
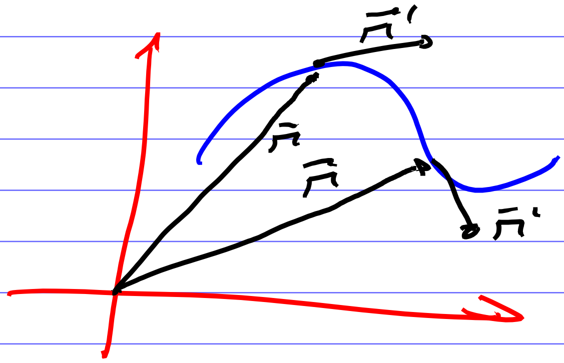
$\vec{r}(t) = \langle t, t^2, t^3 \rangle$

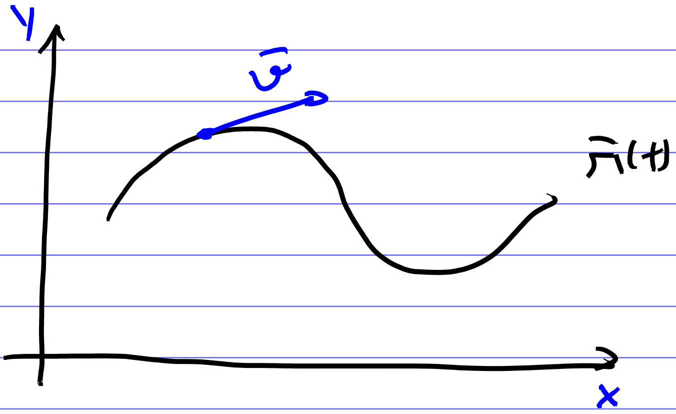
$\vec{r}'(t) = \langle 1, 2t, 3t^2 \rangle$

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

$\vec{r}'$ sempre é tangente à trajetória descrita por $\vec{r}$.







$\vec{T}$ vetor tangente unitário

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

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

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

$$\vec{T}(t) = \frac{\vec{r}'(t)}{|\vec{r}'(t)|}$$

Faça o cálculo de $\vec{T}(t)$ quando se pede apenas $\vec{T}(1)$ é desnecessário.

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

Lembre-se:

$$|\langle a, b, c \rangle| = \sqrt{a^2+b^2+c^2}$$

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

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

$$\vec{r}'(t) \times \vec{r}''(t) = \left| \begin{array}{ccccc} \hat{\imath} & \hat{\jmath} & \hat{k} & \hat{\imath} & \hat{\jmath} \\ 1 & 2t & 3t^2 & 1 & 2t \\ 0 & 2 & 6t & 0 & 2 \end{array} \right.$$

$$= 0\hat{k} - 6t^2\hat{\imath} - 6t\hat{\jmath} + 12t^2\hat{\imath} + 0\hat{\jmath} + 2\hat{k}$$

$$= 6t^2\hat{\imath} - 6t\hat{\jmath} + 2\hat{k}$$

$$= \langle 6t^2, -6t, 2 \rangle$$ Noutra notação.

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

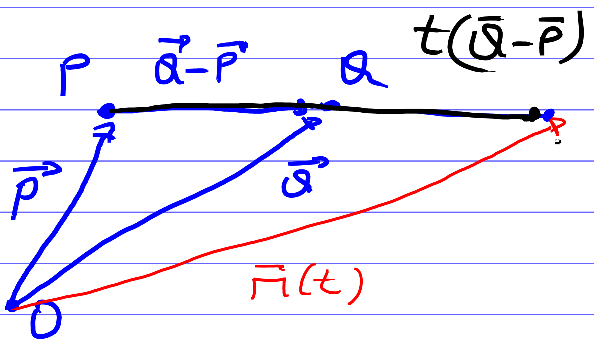
17. $P(0, 0, 0)$, $Q(1, 2, 3)$ **18.** $P(1, 0, 1)$, $Q(2, 3, 1)$

Eq. vetorial — Eq. paramétricas

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

$x = \cos t$
$y = \operatorname{sen} t$
$z = t^2$

Eq. vetorial da reta



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

$\boxed{\text{EQ. vetorial da reta}}$

$t \in \mathbb{R}$

Se $t \in [0,1]$ encontraremos:

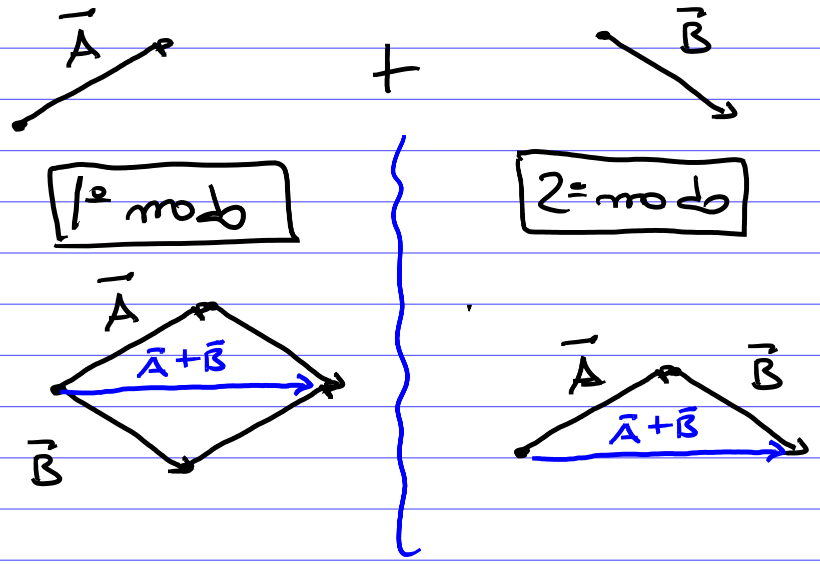
$\vec{r}(0) = \vec{P} + 0(\vec{Q} - \vec{P}) = \vec{P}$

$\vec{r}(1) = \vec{P} + 1(\vec{Q} - \vec{P}) = \vec{Q}$

O segmento de reta que une P a Q.

Lembrando

Somando geometricamente vetores.



Continuando...

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

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

Eq. vetorial da reta

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

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

$\boxed{\vec{R}(t) = \langle 1+t, 3t, 1 \rangle \quad \text{Eq. vetorial}}$

$\boxed{x = 1+t, \quad y = 3t, \quad z = 1 \quad \text{Eq. paramétricas}}$

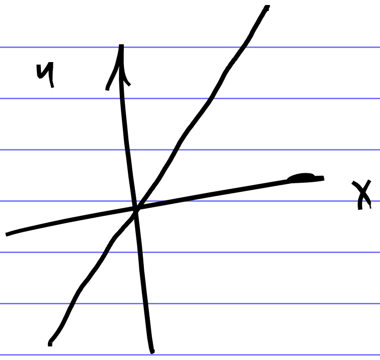
$Z=0$ 1D Punto

2D Reta

3D plano

$x = y$

$\cos t = \cos t$ $-2 .. 2$



$\vec{r}(t) = \langle t, t^2, 0 \rangle$

x y

$y = x^2$

$\vec{r}(t) = \langle \underline{\cos t}, \cos^2 t, 0 \rangle$

x $y = x^2$

-2×2

https://www.geogebra.org/3d/xefwx245