Funções vetoriais

$\mathbb{R} \to \mathbb{R}^n$ $\quad n>1.$

$\mathbb{R} \to \mathbb{R}$

$$\boxed{\begin{array}{c} f(x) = x^2 \\ \uparrow \quad \uparrow \\ \mathbb{R} \to \mathbb{R} \end{array}}$$

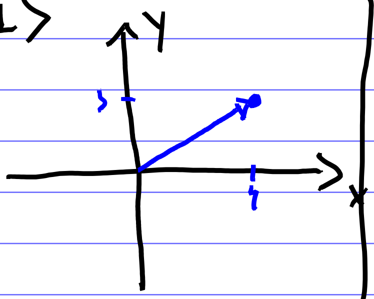
$\mathbb{R} \to \mathbb{R}^3$

$$\underset{\mathbb{R}}{\vec{r}(x)} = \langle \underbrace{x^2, x^3, x}_{\mathbb{R}^3} \rangle$$

$$\vec{r}(2) = \langle 4, 8, 2 \rangle$$

$\vec{f}(t) = \langle t^2, t+1 \rangle$

$\vec{f}(2) = \langle 4, 3 \rangle$



Funções componentes.

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

F.c.x F.c.y F.c.z

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

Qual é a função vetorial mais famosa?

Função vetorial posição:

$$\vec{r}(t) = \langle x(t), y(t), z(t) \rangle$$

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

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

A partícula tá no ponto $(1,0,0)$

Conceito de limite.

$$\lim_{t \to 0} \vec{r}(t) = \langle \lim_{t \to 0} x(t), \lim_{t \to 0} y(t), \lim_{t \to 0} z(t) \rangle$$

Se o conceito de limite se aplica, o de derivada também se aplica.

$$\frac{d\vec{r}(t)}{dt} = \langle \frac{dx}{dt}, \frac{dy}{dt}, \frac{dz}{dt} \rangle$$

Exemplo:

1. Calcule:

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

a) $\lim\limits_{t \to 1} \vec{r}(t) = \lim\limits_{t \to 1} \langle t, t^2, t^3 \rangle$

$= \langle \lim\limits_{t \to 1} t, \lim\limits_{t \to 1} t^2, \lim\limits_{t \to 1} t^3 \rangle$

$= \langle 1, 1, 1 \rangle$

O conceito de continuidade também se aplica:

Uma função vetorial é contínua em t_0 se

$$\lim_{t \to t_0} \vec{r}(t) = \vec{r}(t_0)$$

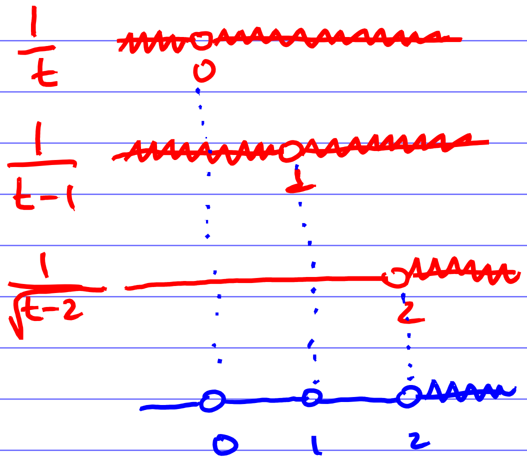
b) $\dfrac{d\vec{r}(t)}{dt} = \dfrac{d}{dt} \langle t, t^2, t^3 \rangle =$

$= \left\langle \dfrac{dt}{dt}, \dfrac{dt^2}{dt}, \dfrac{dt^3}{dt} \right\rangle$

$= \langle 1, 2t, 3t^2 \rangle$

2. Calcule o domínio de $\vec{r}(t)$

$\vec{r}(t) = \left\langle \dfrac{1}{t}, \dfrac{1}{t-1}, \dfrac{1}{\sqrt{t-2}} \right\rangle$



$t - 2 > 0$

$t > 2$

$\boxed{D: \{t \in \mathbb{R} \mid t > 2\}}$

$\boxed{D: t > 2}$

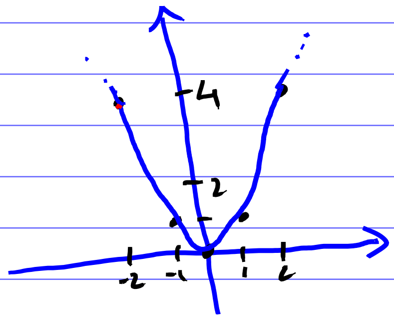
Gráfico

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

Puntos

t	$\vec{r}(t)$
-2	$\langle -2, 4 \rangle$
-1	$\langle -2, 1 \rangle$
0	$\langle 0, 0 \rangle$
1	$\langle 1, 1 \rangle$
2	$\langle 2, 4 \rangle$

← Puntos



Parametricplot((t,t^2),t=-4..4)

Experiencia

WolframAlpha computational intelligence.

parametricplot((t,t^2),t=-4..4)

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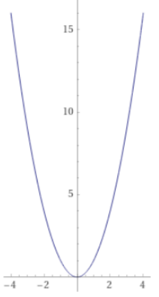
Input interpretation:

parametric plot | t, t^2 | $t = -4$ to 4

Parametric plot:



Arc length of parametric curve: More digits Step-by-step solution

$$\int_{-4}^{4} \sqrt{1+4t^2}\, dt = \frac{1}{2}\left(8\sqrt{65} + \sinh^{-1}(8)\right) \approx 33.637$$

WolframAlpha computational intelligence.

parametricplot((cos(t),sin(t),t^2),t=-4..4)

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Input interpretation:

parametric plot | $\cos(t)$, $\sin(t)$, t^2 | $t = -4$ to 4

Parametric plot: