13.1 : Vector Fcts and Space Curves

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Context

Vector valued fcts $r: \mathbb{R} \mapsto \mathbb{R}^n$.

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

curves of this type are called space curves.

NOTE: $r: \mathbb{R} \mapsto \mathbb{R}^n$ is similar to how we looked @ parametric eqn $t \mapsto (x(t), y(t)$

Ex1: Find the domain of $\vec{r}(t) = \langle \sqrt{9-t^2}, \frac{1}{t}, \ln(t+2) \rangle$

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

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

Ex2: Find $\lim_{t \to 1} \left\langle \sqrt{t+3}, \frac{t-1}{t^2-1}, \frac{\tan(t-1)}{(t-1)} \right\rangle$

Def: $\vec{r}(t)$ is continuous @ $t=a$ if $\lim_{t \to a} \vec{r}(t) = \vec{r}(a)$

Ex3: Describe $\vec{r}(t) = \langle 2+t, -1-t, 5+2t \rangle$

Ex4: Describe $\vec{r}(t) = \cos(t)\,\vec{i} + \sin(t)\,\vec{j} + t\,\vec{k}$