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# Vector Functions and Space Curves

A vector valued fct $r: \mathbb{R} \longmapsto \mathbb{R}^n$. specifically, we care about $\vec{r}(t) = \langle x(t), y(t), z(t) \rangle$. Curves of this type are called space curves.

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

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

Ex3: Describe $\vec{r}(t) = \langle 2+t, -1-t, 5+2t \rangle$ (line in 3-space).

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

* Demo of Wolfram Alpha.