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Limits

Def: Let $\phi(t)$ be a scalar function. Then $\lim_{t \to t_0} \phi(t) = \phi_0$ if for every $\epsilon > 0$ there exists a $\delta > 0$ s.t. $|\phi(t) - \phi_0| < \epsilon$ whenever $0 < |t - t_0| < \delta$

Limits of vector functions: Let $\vec{F}(t)$ be a vector valued function. Then $\lim_{t \to t_0} \vec{F}(t) = \vec{F_0}$ if $\forall \epsilon > 0$ $\exists$ a $\delta > 0$

$|\vec{F}(t) - \vec{F_0}| < \epsilon$ whenever $0 < |t - t_0| < \delta$

Continuity

Scalar function: A scalar function $\phi(t)$ is continuous at $t = t_0$ if $\lim_{t \to t_0} \phi(t) = \phi(t_0)$ i.e. $\forall \epsilon > 0$ $\exists$ a $\delta > 0$ s.t. $|\phi(t) - \phi(t_0)| < \epsilon$ whenever $|t - t_0| < \delta$

Vector function: A vector function $\vec{F}(t)$ is ~~sad~~ said to be continuous at $t = t_0$ if $\lim_{t \to t_0} \vec{F}(t) = \vec{F}(t_0)$ i.e. $\forall \epsilon > 0$ $\exists$ a $\delta > 0$

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s.t. $|\vec{F}(t) - \vec{F}(t_0)| < \epsilon$ whenever $|t - t_0| < \delta$.

Ordinary Differentiation of scalars:

Let $\phi(t)$ be a scalar field. Then the ordinary derivative of the scalar $\phi(t)$ is defined as

$$\frac{d\phi(t)}{dt} = \lim_{\Delta t \to 0} \frac{\phi(t+\Delta t) - \phi(t)}{\Delta t}$$

Ordinary Differentiation of vectors:

Let $\vec{F}(t)$ be a vector valued function. Then the ordinary derivative of the vector $\vec{F}(t)$ is defined as

$$\frac{d\vec{F}(t)}{dt} = \lim_{\Delta t \to 0} \frac{\vec{F}(t+\Delta t) - \vec{F}(t)}{\Delta t}$$