# Parametrized Curves

↳ a goal: tangent planes to level surfaces.

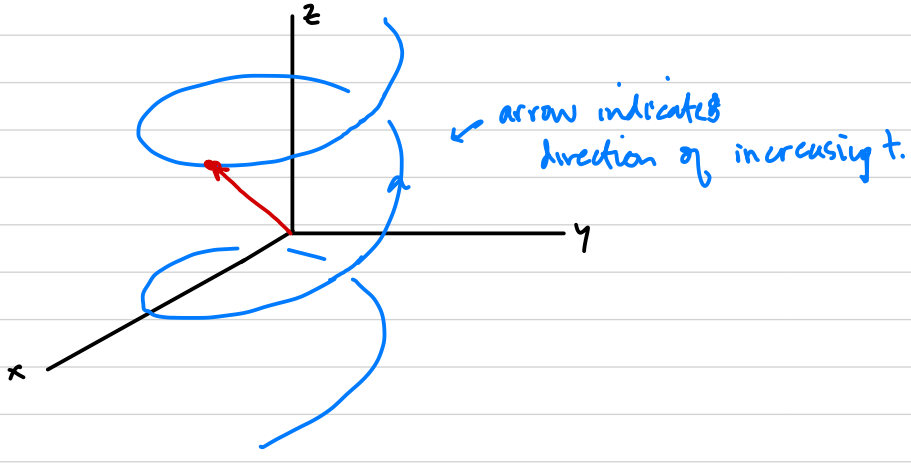
Consider functions

$$\bar{r} : \mathbb{R} \to \mathbb{R}^n$$

input variable referred as "parameter"

gives a curve in $\mathbb{R}^n$

EX $\bar{r}(t) = (\cos t, \sin t, t)$



For a vector function

$$\bar{r} : \mathbb{R} \to \mathbb{R}^n \qquad \text{e.g. } \bar{r}(t) = (f(t), g(t), k(t))$$

we have

vector

$$\bar{r}'(t) = \lim_{h \to 0} \frac{\bar{r}(t+h) - \bar{r}(t)}{h}$$

$$= \left( \lim_{h \to 0} \frac{f(t+h) - f(t)}{h}, \lim_{h \to 0} \frac{g(t+h) - g(t)}{h}, \lim_{h \to 0} \frac{k(t+h) - k(t)}{h} \right)$$

$$= (f'(t), g'(t), k'(t))$$

$\bar{r}'(t)$

Same entries as $D\bar{r}(t)$...
but consider it a vector.