Lecture 4

* Questions

First topic of Calculus : limit

↑

this is most fundamental concept of Calculus.

Derivatives and integrals, which are the main focus of calculus, are special types of limits.

What is limit? We need a function f and a number (point) a.

$$\lim_{x \to a} f(x) = L \quad : \quad f(x) \text{ tends to } L \text{ as } x \text{ tends to } a.$$

Another notation: $f(x) \longrightarrow L$ as $x \longrightarrow a$.

Ex: you are born on 01/01/03. Your age is a function of time: $f(t)$
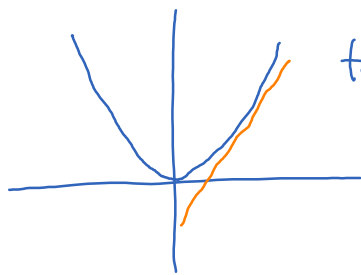
As $t \to 01/01/2023$, your age tends to 20.

Limit concerns the trend of the function <u>near</u> a point, not <u>at</u> the point

Ex :

Speedometer on your car

$$x(t) = 2t^2$$

velocity $\quad \dfrac{x(2) - x(1)}{2 - 1}$

$\underline{\underline{\text{Ex}}}$

tangent line to $y = x^2$ at $x = 1$.

worksheet problems....

① graph given, find limits of f.

② $\lim\limits_{x \to 0} \ln x$, $\lim\limits_{t \to 0} \dfrac{t^2}{t^2}$, $\lim\limits_{t \to 1^+} \dfrac{t}{t-1}$, $\lim\limits_{t \to \pi} \tan t$,

$\lim\limits_{x \to 2} \dfrac{x^2 - 2x}{x^2 - x - 2}$ ($x = 2.1, 2.05, 2.01, 2.005, 2.001,$

$1.9, 1.95, 1.99, 1.995, 1.999$)

③ Slope of tangent line