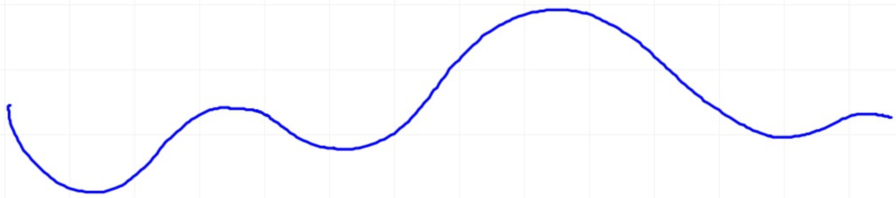
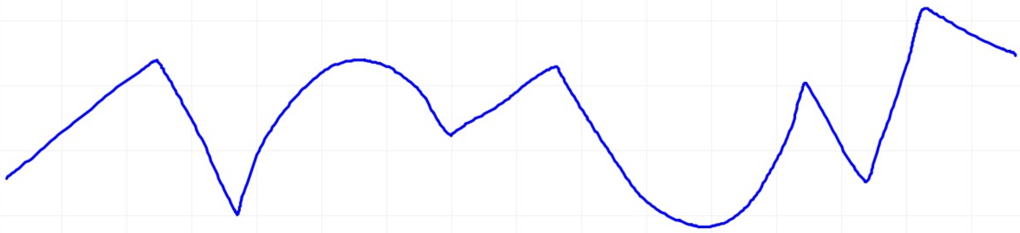
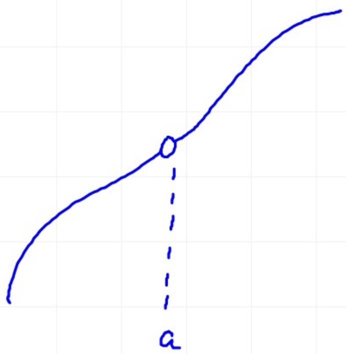
Continuity

at a number

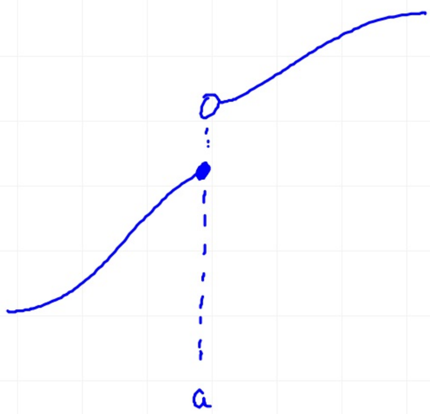
on an interval





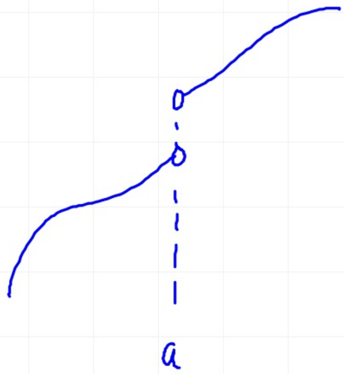


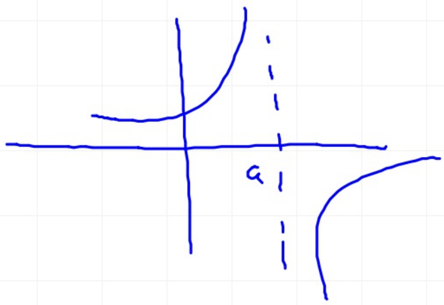
$f(a)\ \nexists$



$f(a)\ \exists$

$\lim_{x \to a} f(x)\ \nexists$





f is cont at $x=a$ iff

$f(a)\ \exists$

$\lim_{x \to a} f(x)\ \exists$

$f(a) = \lim_{x \to a} f(x)$

Is $f(x) = \dfrac{x^2 - x - 2}{x - 2}$ cont at $x = 2$?

<u>Cont test at $x = 2$</u>

$f(2) \nexists$ $\therefore$ f is disc. at $x = 2$.

Is $g(x) = \dfrac{x+3}{x-7}$ cont at $x = 7$?

<u>Cont test at $x = 7$</u>

$f(7) \nexists$ $\therefore$ f is disc. at $x = 7$.

Removable vs Essential discon.

if $\lim_{x \to a} f(x) \exists$

$\lim_{x \to a} f(x) \nexists$

Is $f(x) = \dfrac{x^2+2x-15}{x-3}$ cont at $x=3$?

Is $f(x) = \frac{x^2+2x-15}{x-3}$ cont at $x=3$? Determine if the disc. is removable or essential. If removable, redefine f so that it is cont.

Cont test at $x=3$

$f(3)$ $\nexists$ $\therefore$ f is discon. at $x=3$.

Remov. or Essen

Discon. is removable because $\lim_{x\to 3} f(x) = 8$.

Redefine f

$$f(x) = \begin{cases} \frac{x^2+2x-15}{x-3} & x \neq 3 \\ 8 & x = 3 \end{cases}$$

Is $f(x) = \begin{cases} x^2 & x < 2 \\ 2x & x \geq 2 \end{cases}$ cont at $x = 2$?

<u>Cont test at $x = 2$</u>

$f(2) = 4$

$$\left.\begin{array}{l} \lim\limits_{x \to 2^+} f(x) = 4 \\ \lim\limits_{x \to 2^-} f(x) = 4 \end{array}\right\} \therefore \lim\limits_{x \to 2} f(x) = 4.$$

$\therefore$ f is cont at $x = 2$ because $f(2) = \lim\limits_{x \to 2} f(x)$.

Determine where $f(x) = \begin{cases} x^2 - 49 & x \leq -7 \\ 49 - x^2 & -7 < x < 7 \\ 5 - x & x \geq 7 \end{cases}$ is discon.

Cont test at $x = 7$

$f(7) = -2$

$\left.\begin{array}{l} \lim\limits_{x \to 7^+} f(x) = -2 \\ \lim\limits_{x \to 7^-} f(x) = 0 \end{array}\right\} \therefore \lim\limits_{x \to 7} f(x) \nexists$

f is discont at $x = 7$

because $\lim\limits_{x \to 7} f(x) \nexists$.

Cont test at $x = -7$

$f(-7) = 0$

$\left.\begin{array}{l} \lim\limits_{x \to -7^+} f(x) = 0 \\ \lim\limits_{x \to -7^-} f(x) = 0 \end{array}\right\} \therefore \lim\limits_{x \to -7} f(x) = 0$

$\therefore$ f is cont at $x = -7$

because $f(-7) = \lim\limits_{x \to -7} f(x)$.

For what value(s) of b will $f(x) = \begin{cases} \frac{x^2-25}{x-5} & x \neq 5 \\ b & x = 5 \end{cases}$

be cont at $x = 5$.

<u>Cont test at $x = 5$</u>

$f(5) = b$

$\lim_{x \to 5} f(x) = 10$

$\therefore$ For f to be cont at $x = 5$, $b = 10$.

$$f(x) = \frac{x-3}{x-5}$$

Cont on $[5, 7)$ no

$(5, 7)$ yes

$(-7, 0)$ yes

$(-3, 3)$ yes

$[-1, 10]$ no