

Discontinuity

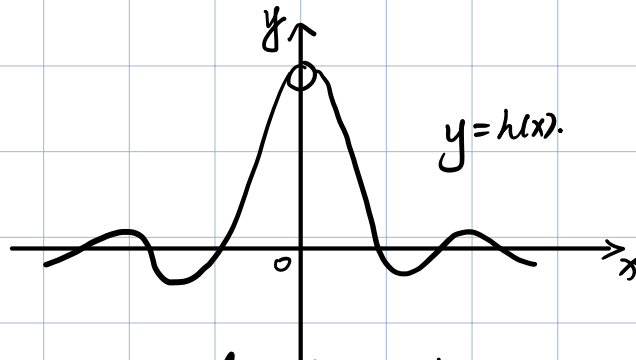
1. f is continuous at a means $\lim_{x \rightarrow a} f(x) = f(a)$

2. Type of discontinuity at a .

1) Removable Discontinuity: a hole.

$\lim_{x \rightarrow a} f(x)$ exists, but $\lim_{x \rightarrow a} f(x) \neq f(a)$.

e.g. $h(x) = \frac{\sin x}{x}$. $\lim_{x \rightarrow 0} h(x) = 1$, $h(0)$ undefined.



Define a new function H

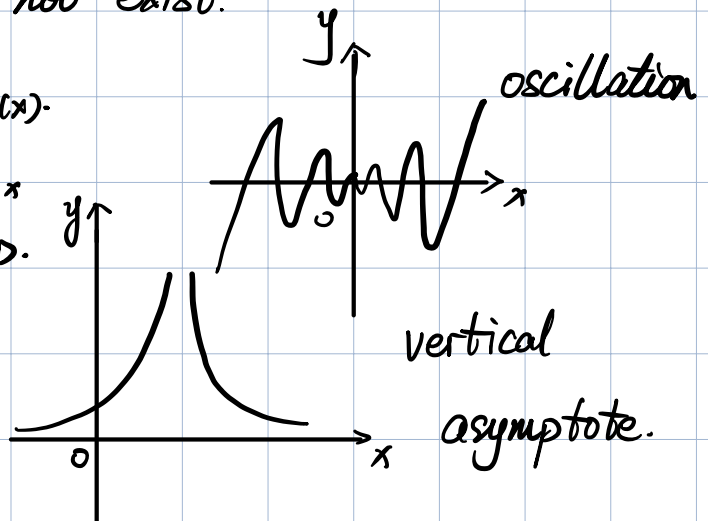
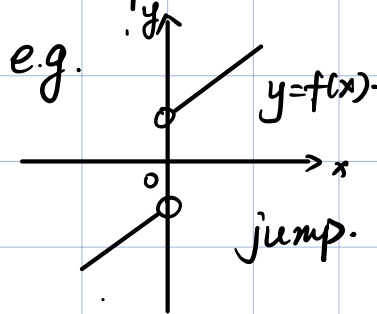
$$H(x) = \begin{cases} \frac{\sin x}{x} & \text{if } x \neq 0 \\ 1 & \text{if } x = 0. \end{cases}$$

fixed.

Then H is continuous at 0.

2) Non-removable discontinuity.

$\lim_{x \rightarrow a} f(x)$ does not exist.



when in some other subjects, we usually mean $H(x)$ rather than $h(x)$.

