FAR BEYOND

MAT122

Continuity

Stony Brook University

Continuity - Definition

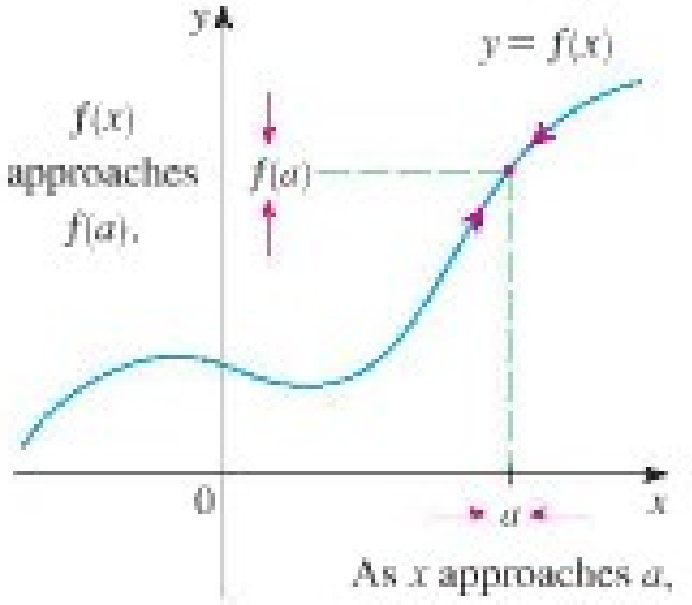
Rule of Thumb: f is continuous where graph can be drawn without picking up pen from paper

a function f is **continuous at $x=a$** if

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

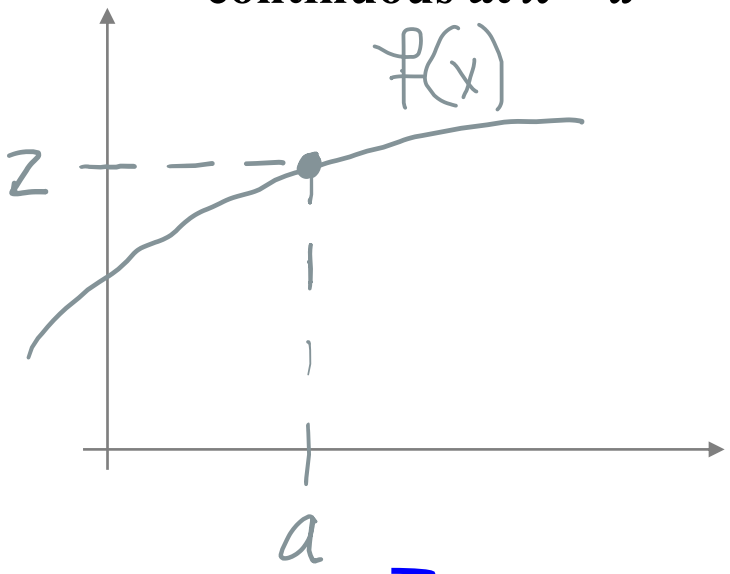
i.e., if f is continuous at a, following conditions must be met:

1. $f(a)$ is defined at a
2. $\lim_{x \to a} f(x)$ exists
3. $\lim_{x \to a} f(x)$ and $f(a)$ are the same value



Discontinuity

continuous at $x = a$



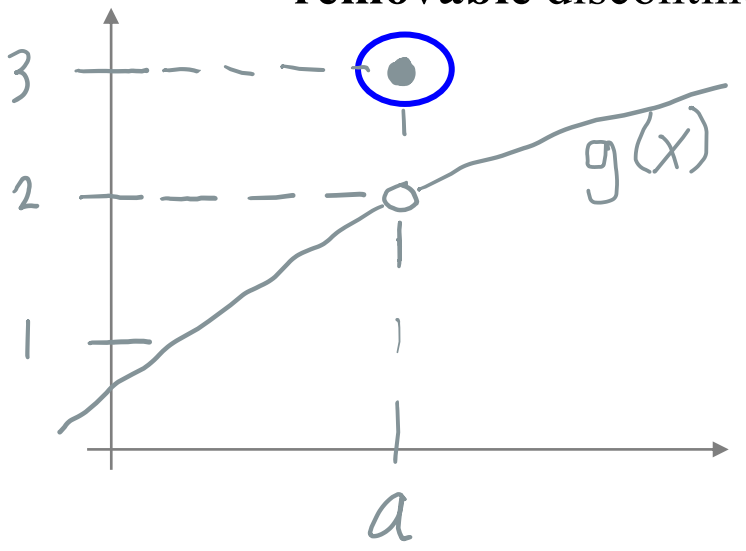
$$\lim_{x \to a} f(x) = 2$$

$$f(a) = 2$$

same

$\therefore f(x)$ is continuous at a

removable discontinuity



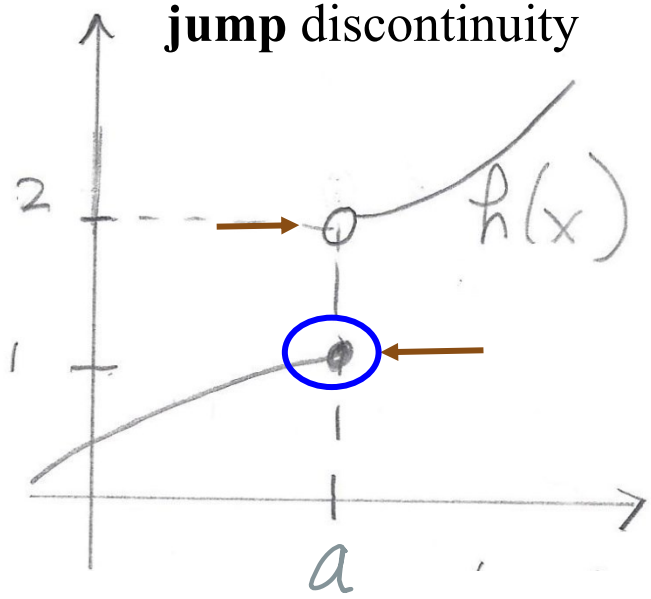
$$\lim_{x \to a} g(x) = 2$$

$$g(a) = 3$$

differ

$\therefore g(x)$ is not continuous at a

jump discontinuity



$$\lim_{x \to a^-} h(x) = 1$$

$$\lim_{x \to a^+} h(x) = 2$$

$$\lim_{x \to a} h(x) \text{ DNE}$$

$$h(a) = 1$$

$\therefore h(x)$ only continuous from the left at a

$f(a)$ is defined on the left interval