Continuous vs. Discontinuous Functions

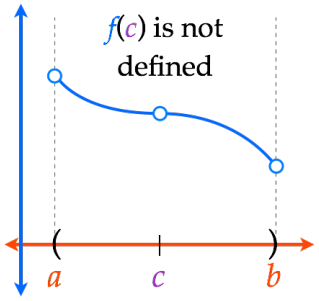
Name _____

Date _____ Period _____

Definition of Continuity at a Point

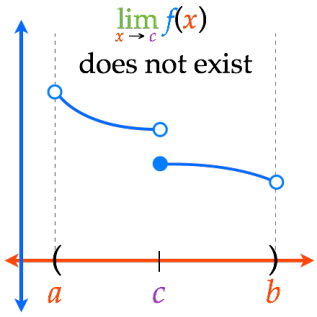
A function, f, is continuous at point c if the following three conditions are met…

1. $f(c)$ is defined



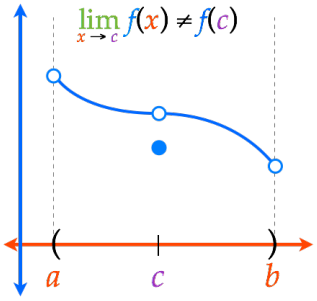
f is discontinuous at point c.

2. $\lim_{x \to c} f(x)$ does exist



f is discontinuous at point c.

3. $\lim_{x \to c} f(x) = f(c)$



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Find points of discontinuity WHY?

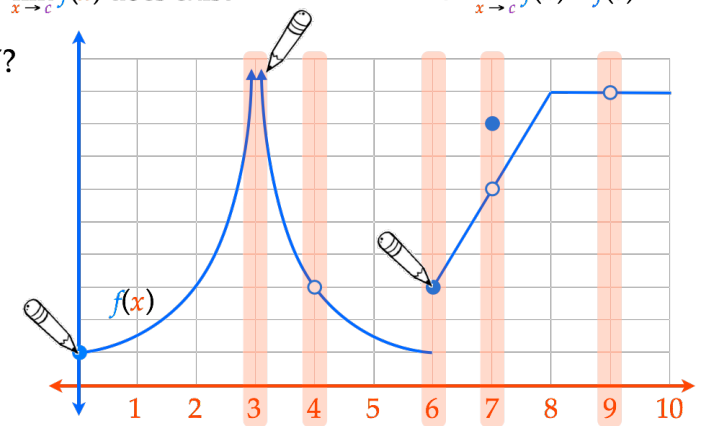
$x = 3$

$x = 4$

$x = 6$

$x = 7$

$x = 9$



Discontinuities fall into two categories: Removable and Non-Removable

A discontinuity at c is called removable if f can be made continuous by defining (or redefining) $f(c)$ (filling in the hole).

Find points of discontinuity WHY?

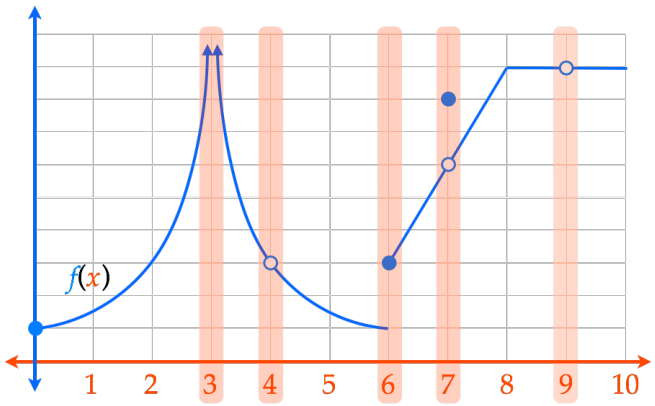
$x = 3$

$x = 4$

$x = 6$

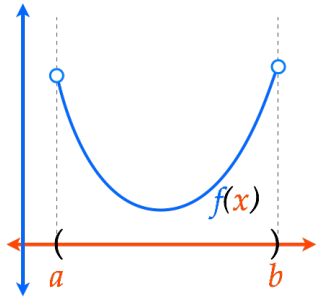
$x = 7$

$x = 9$

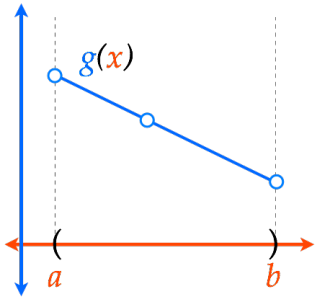


Continuity on an Open Interval

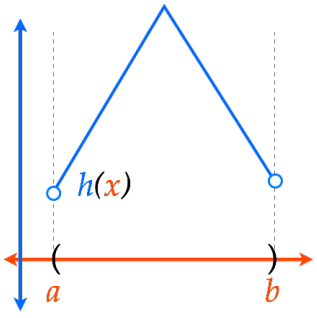
A function, f, is continuous on an open interval (a,b) if it is continuous at each point in the interval.



$f(x)$ is continuous on (a,b)



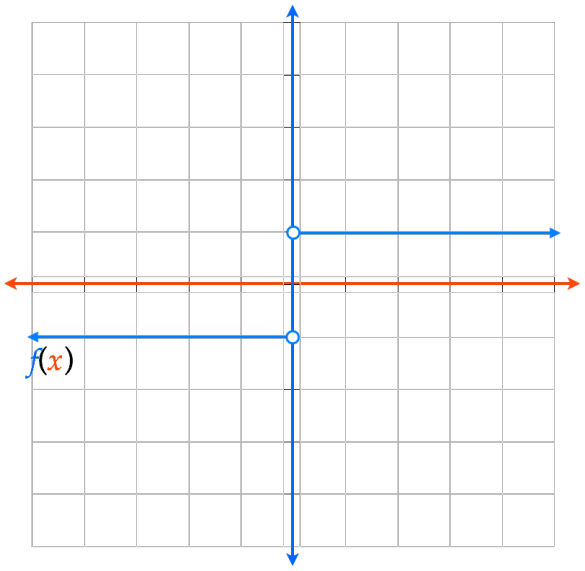
$g(x)$ is not continuous on (a,b)



$h(x)$ is continuous on (a,b)

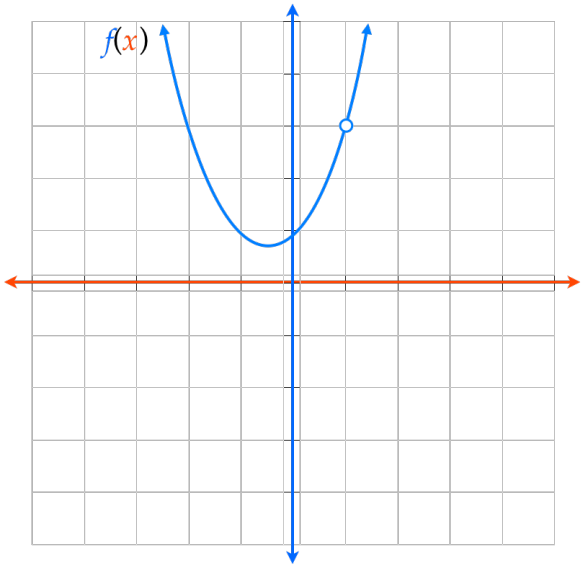
Define the Interval where $f(x)$ is continuous

$$f(x) = \frac{|x|}{x}$$



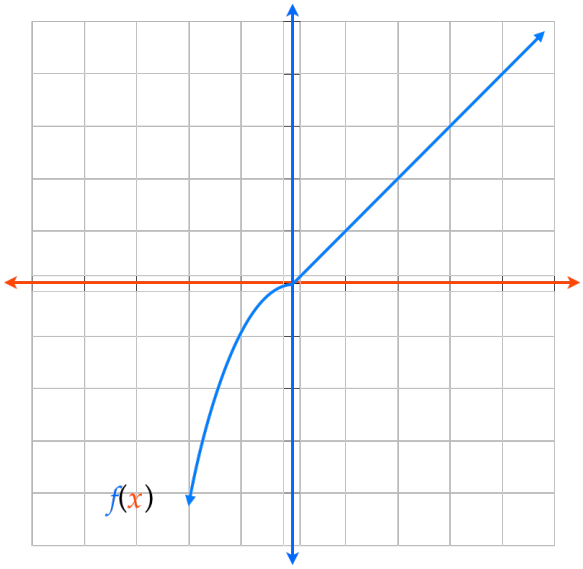
Define the Interval where $f(x)$ is continuous

$$f(x) = \frac{x^3 - 1}{x - 1}$$



Define the Interval where $f(x)$ is continuous

$$f(x) = \begin{cases} -x^2, & x \le 0 \\ x, & x > 0 \end{cases}$$



Definition of Continuity at a Point

A function, f, is continuous at point c if the following three conditions are met…

1. $f(c)$ is defined
2. $\lim_{x \to c} f(x)$ does exist
3. $\lim_{x \to c} f(x) \neq f(c)$

Discontinuities fall into two categories: Removable and Non-Removable

A discontinuity at c is called removable if f can be made continuous by defining (or redefining) $f(c)$.

A function, f, is continuous on an open interval (a,b) if it is continuous at each point in the interval.