

Date: 10/8/18

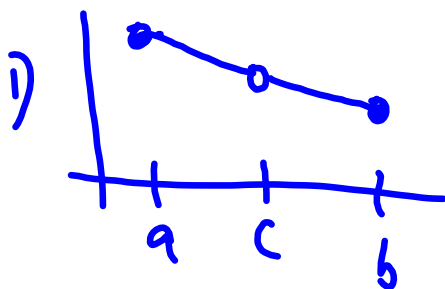
Chp: Chp. 2:3 → Continuity

- Obj:
- Identify different types of continuity
  - Determine if a function is continuous or not
  - Identify discontinuities.

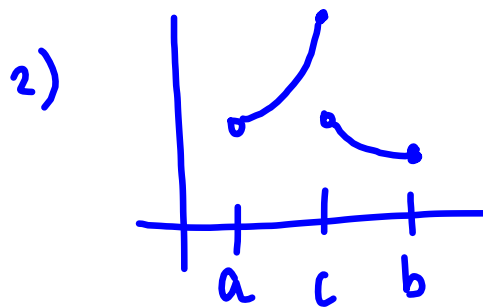
\* Continuity at a Point = A function is continuous @  $c$  if the following 3 conditions are met:

- 1)  $f(c)$  is defined (no holes)
- 2)  $\lim_{x \rightarrow c} f(x)$  exists (no breaks)
- 3)  $\lim_{x \rightarrow c} f(x) = f(c)$  (no hole)

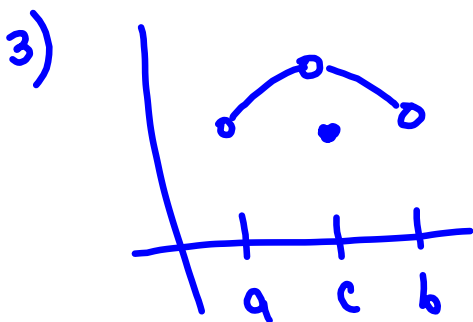
Ex:



$f(c)$  is not defined



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



$\lim_{x \rightarrow c} f(x) \neq f(c)$

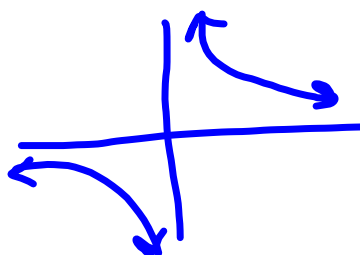
### 3 Types of Discontinuities

- 1) Infinite (asymptote)  $\rightarrow$  denom = 0
- 2) Point (hole)  $\rightarrow$  num. & denom. share a common factor.
- 3) Jump (break)  $\rightarrow$  piecewise  $f(x)$



Ex. 1

$$f(x) = \frac{1}{x}$$



- Continuous or **Discontinuous**
- Domain?  $(-\infty, 0) \cup (0, \infty)$
- Type of Discontinuity = Infinite
- Rem or **Non-Rem**

Ex. 2

$$g(x) = \frac{x^2 - 1}{x - 1}$$

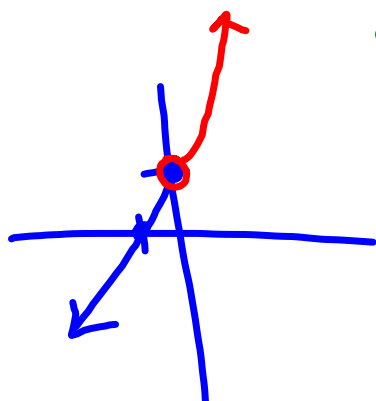
$(x+1)(x-1)$   
 $x-1$

$x-1=0$   
 $x=1$

- a) Domain?  $(-\infty, 1) \cup (1, \infty)$
- b) Continuous or Discontinuous
- c) Type of Discontinuity = Point
- d) Rem or Non-Rem

Ex. 3

$$h(x) = \begin{cases} x+1 & x \leq 0 \\ e^x & x > 0 \end{cases}$$



$D = (-\infty, \infty)$   
 $(-\infty, 0] \cup (0, \infty)$   
Continuous

Ex. 4

$$m(x) = \sin x$$

a)  $D = (-\infty, \infty)$

b) Continuous



Ex. 5 At what pts is the function discontinuous?

$$f(x) = \frac{x}{x^2 - x} = \frac{1}{x-1}$$

$x=0 \rightarrow$  point, removable

$x-1=0 \rightarrow x=1$ , infinite, non-rem

Ex. 6 At what pts is the function  
discontinuous?  
Type? Rem or Not?

$$g(x) = \frac{x-1}{x^2+x-2}$$

homework:

p. 84 (# 1-9 odds, 11-19, 21, 23, 24)