2.3 A

Friday, August 16, 2019 10:25 AM

2.3A Notes – Continuity of Functions

What makes a function continuous at a point?

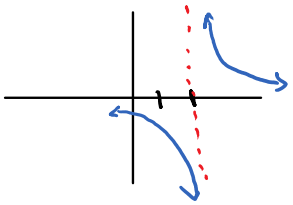
A function f(x) is continuous at x = c when the following conditions hold:

1. $f(c)$ exists
2. $\lim_{x \to c} f(x)$ = exist $\left(\lim_{x \to c^-} f(x) = \lim_{x \to c^+} f(x)\right)$
3. $\lim_{x \to c} f(x) = f(c)$

What make a function discontinuous at a point?

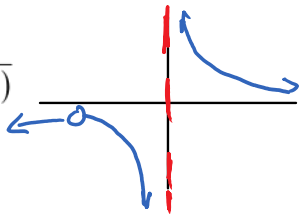
4 Different Types of Discontinuity

1. $f(x) = \dfrac{1}{x-2}$



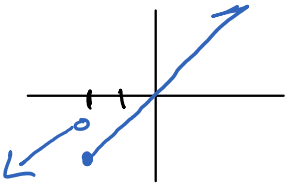
Infinite discontinuity @ x = 2

2. $f(x) = \dfrac{x+4}{x(x+4)}$



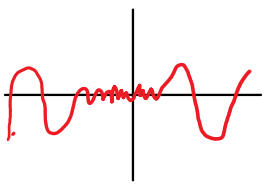
Removable discontinuity @ x = -4

3. $f(x) = \begin{cases} x, x < -2 \\ 3x, x \geq -2 \end{cases}$



Jump discontinuity @ x = -2

4. $f(x) = \sin\left(\dfrac{1}{x}\right)$



Oscillating discontinuity @ x = 0

Ex: Find each discontinuity for the function and what type they are.

a) $f(x)=\dfrac{x+1}{x^2+4x+3}$ $\Rightarrow \dfrac{(x+1)}{(x+1)(x+3)}$

$x=-3$ Infinite disc.

$x=-1$ Rem. Disc.

b) $f(x)=\begin{cases}3-x, x<2\\ \dfrac{x}{2}+1, x\geq 2\end{cases}$

$\lim_{x\to 2^-} f(x)$ $3-2=1$

$\lim_{x\to 2^+} f(x)=\frac{2}{2}+1=2$

Jump Disc.

$x=2$

Ex: Find a value for "a" such that the function f(x) is continuous.

$$f(x)=\begin{cases}2x+3, x<3\\ ax+1, x\geq 3\end{cases}$$

$f(3)=3a+1$

$3a+1=2(3)+3$

$3a+1=6+3$

$3a+1=9$

$3a=8$

$a=8/3$

Intermediate Value Theorem (IVT) Desmos Activity Summary:

x	f(x)
-2	4
-1	-2
0	7
1	6
2	-3

f is a continuous function on $[-2,2]$

what is the least # of times $f(x)=0$? Justify

At least 3 since f is continuous and changes signs 3 different times on the interval

IVT: A function f that is continuous on $[a,b]$ takes on every value between $f(a)$ & $f(b)$