<u>Continuity</u>

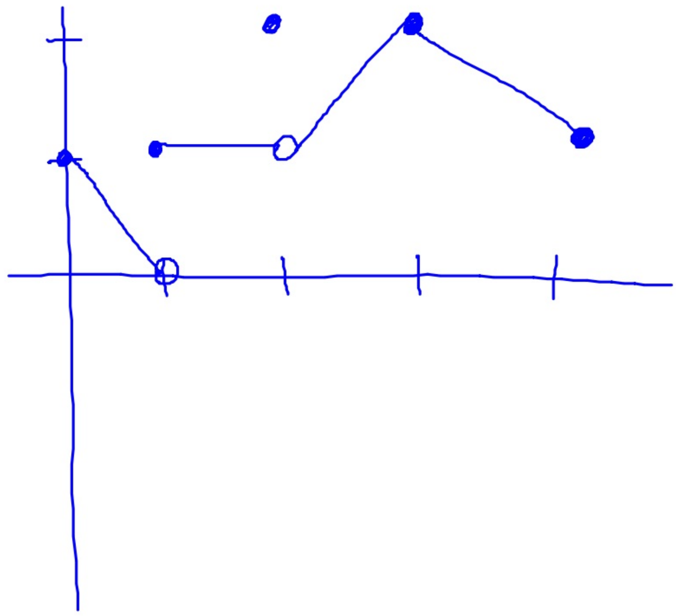
Conditions for Continuity of a function $f(x)$ at $x = c$:

1. $f(c)$ exists – the point exists at c
2. $\lim_{x\to c} f(x)$ exists – f has a limit as $x \to c$
3. $\lim_{x\to c} f(x) = f(\cancel{x}c)$ – the limit equals the function value

Types of Discontinuties

1. Removable – when you can simplify and cancel the discontinuity (i.e. a hole)
2. Nonremovable – when you cannot cancel it (i.e. a vertical asymptote)

# Continuity:



on $[0,4]$

$x = 1$: No, $\lim_{x\to 1} f(x)$ DNE

$x = 2$: No, $\lim_{x\to 2} f(x) \neq f(2)$

$x = 3$: yes ✓

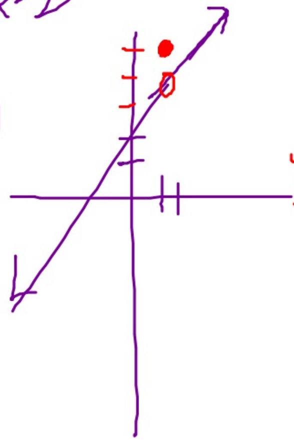
The functions below are discontinuous at $x = 2$. Determine whether the discontinuity is removable or non-removable, then find $\lim_{x\to 2} f(x)$ if it exists.

$$f(x) = \frac{x^2+x-6}{x-2}$$

$$\lim_{x\to 2} \frac{(x+3)\cancel{(x-2)}}{\cancel{x-2}} = 2+3 = 5$$

$$f(x) = \begin{cases} \dfrac{x^2-4}{x-2}, & x \neq 2 \\ 5, & x = 2 \end{cases}$$

$$\frac{(x+2)\cancel{(x-2)}}{\cancel{x-2}}$$



$$\lim_{x\to 2} f(x) = 4$$

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

**Find the value of the constant a that will make the function continuous where the defining rule changes.**

**p. 26 #1**

$$f(x)=\begin{cases}-.4x-2 & x\le 1\\ .3x-a & x>1\end{cases}$$

$-.4(1)-2=.3(1)-a$

$-2.4=.3-a$

$-2.7=-a$

$a=2.7$

Prove it!

$$f(x)=\begin{cases}-.4x-2 & x\le 1\\ .3x-2.7 & x>1\end{cases}$$

① $f(1)$ exists

$f(1)=-.4(1)-2=-2.4$

② $\lim\limits_{x\to 1} f(x)$ exists

$\lim\limits_{x\to 1^-} f(x)=-.4(1)-2=-2.4$

$\lim\limits_{x\to 1^+} f(x)=.3(1)-2.7=-2.4$

$\lim\limits_{x\to 1} f(x)=-2.4$

$\lim\limits_{x\to 1} f(x)=f(1)=-2.4 \therefore f(x)$ is cont. @ 1

Assignment

Complete the Limits,Continuity,Functions Section

(Skip p. 18) & Log Review

QUIZ FRIDAY