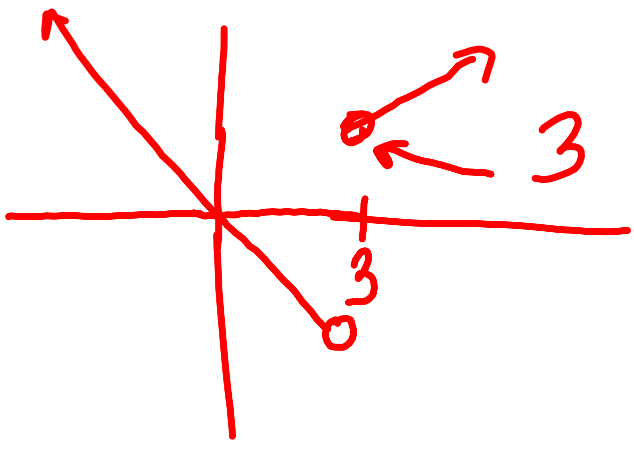
$$\lim_{x \to 3^+} \frac{x|x-3|}{x-3} = 3$$

$$\lim_{x \to 3^+} \frac{x\cancel{(x-3)}}{\cancel{x-3}} \qquad \lim_{x \to 3^+} \frac{x(-\cancel{(x-3)})}{\cancel{x-3}}$$

$$\lim_{x \to 3^+} x \qquad \lim_{x \to 3^+} -x$$



Lesson 6: Continuity

Warm Up

Is there some number a, such that this limit exists?

$$\lim_{x\to 3}\frac{2x^2-3ax+x-a-1}{x^2-2x-3} = \lim_{x\to 3}\frac{\overbrace{2x^2-3ax+x-a-1}^{P(x)}}{(x-3)(x+1)}$$

If so, find the value of a and find the limit.
If not, explain why not.

Scrap Paper

$P(3)=0$

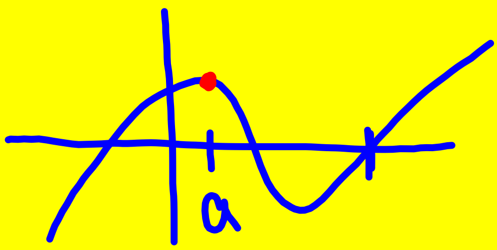
$\boxed{a=2}$

Feb 10-5:04 PM

Lesson 6: Continuity

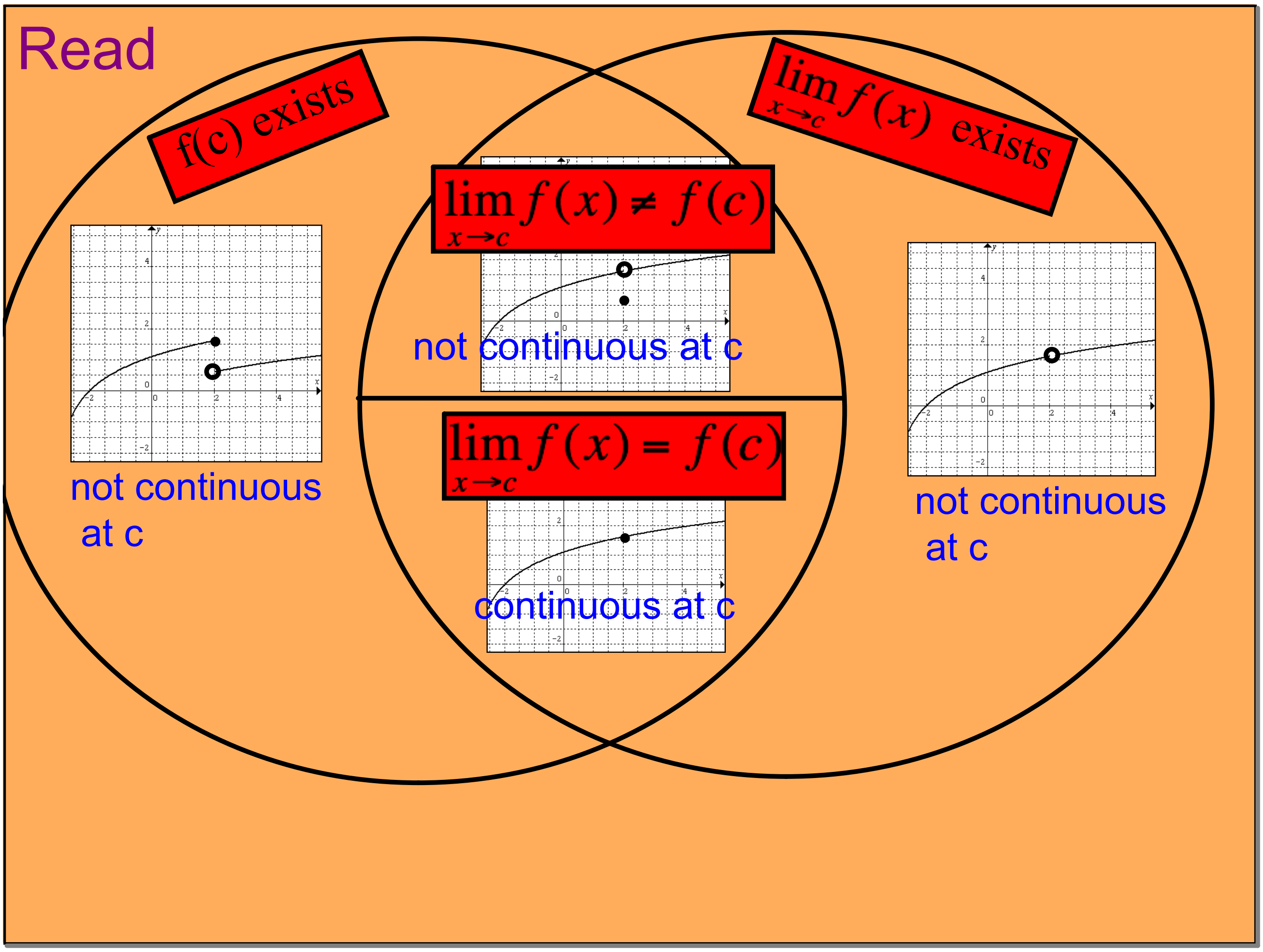
COPY!!

A function y = f(x) is continuous at x = a if…

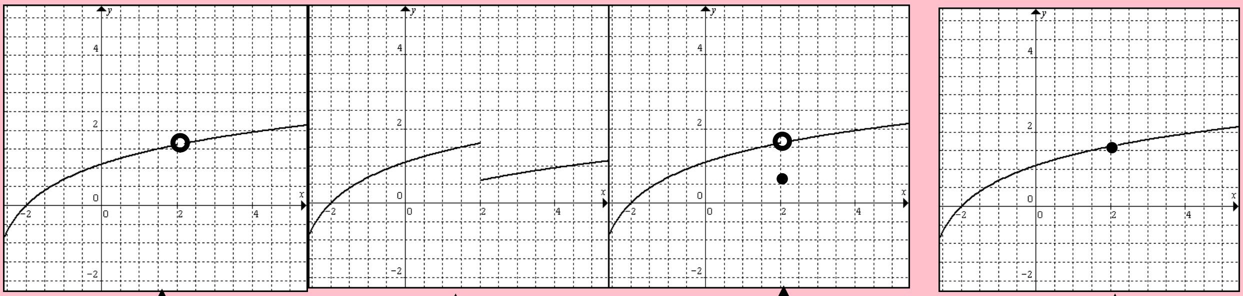


Defn. A function f is <u>continuous on an open interval (a,b)</u> if it is continuous at every point in (a,b).

Feb 10-8:41 AM


Read
f(c) exists
$\lim_{x \to c} f(x)$ exists
$\lim_{x \to c} f(x) \neq f(c)$
not continuous at c
$\lim_{x \to c} f(x) = f(c)$
continuous at c
not continuous at c
not continuous at c

Read



f undefined at c
$\lim_{x \to c} f(x)$ exists
not continuous at c

f defined at c
$\lim_{x \to c} f(x)$ D.N.E.
not continuous at c

f defined at c
$\lim_{x \to c} f(x)$ exists
but $\lim_{x \to c} f(x) \neq$ f(c)
not continuous at c

f defined at c
$\lim_{x \to c} f(x)$ exists
and they're =
continuous at c

Read

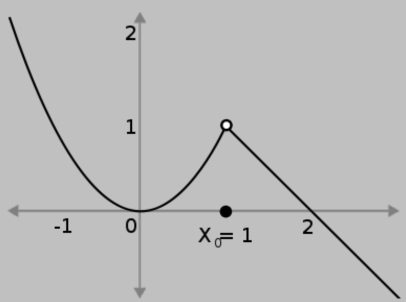
Classifying Discontinuities

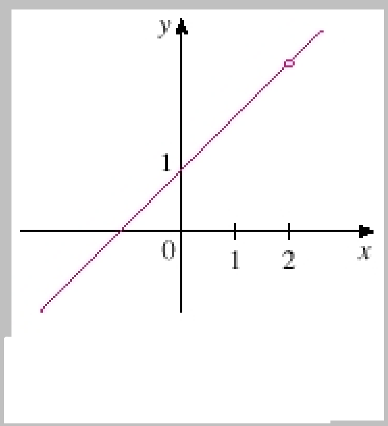
Removable or point
(Holes)
2 sided limit exists

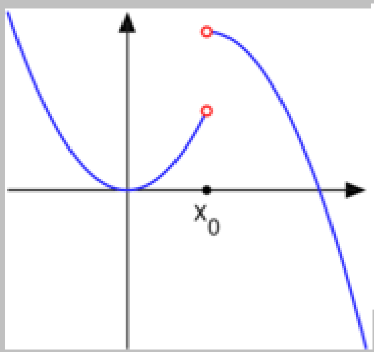
Essential or Non-removable

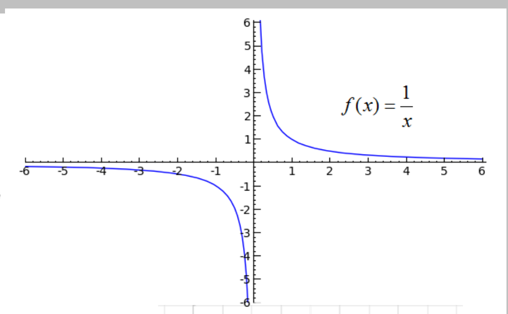
Jump
1 sided limits exist

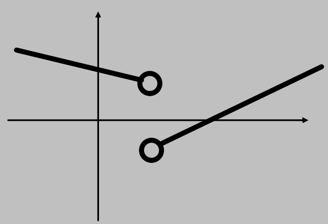
Infinite
(vertical asymptotes)
at least one of the
1 sided limits don't exist

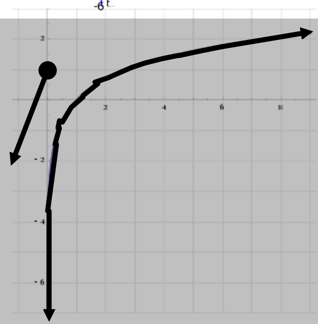












1. Over what values of x, is $y = \sqrt{2-x}$ continuous?

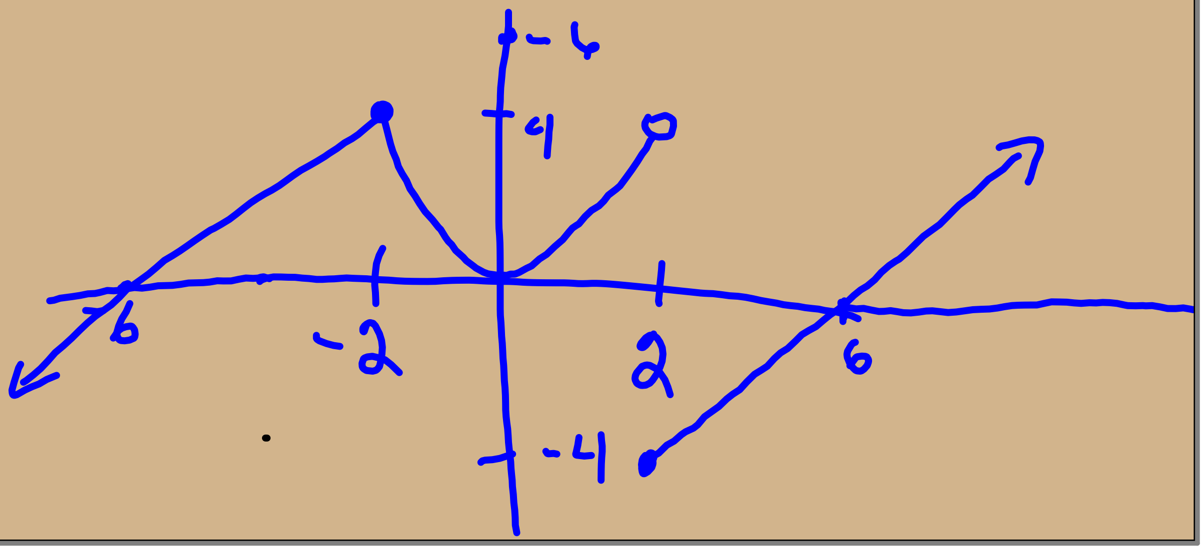
A) $x \in \mathbb{R}$ B) $x < 2$ C) $x \leq 2$ D) no values of x.

2. The function, y = *f*(x) is discontinuous at x = :

$$f(x) = \begin{cases} x+6, & x \leq -2 \\ x^2 & -2 < x < 2 \\ x-6 & x \geq 2 \end{cases}$$

A) -2, 2 B) 2 only

C) -2 only D) Nowhere



ex. Find a and b so that f(x) is everywhere continuous.

$$f(x)=\begin{cases}\frac{1}{8}ax^3-bx+3, & x>2\\ 2x-\frac{1}{2}x^2, & x=2\\ \frac{1}{4}ax^3-bx-5, & x<2\end{cases}$$

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

① @ $x=2$

$\frac{1}{8}a(2)^3-b(2)+3=2$

$\cancel{\frac{1}{8}}a(\cancel{8})-2b+3=2$

$a-2b=-1$

③ $\frac{1}{4}a(2)^3-b(2)-5=2$

$2a-2b=7$

Use elimination {or substitution} to solve for a + b:

$$-\begin{array}{r} a-2b=-1\\ 2a-2b=7\\ \hline -a\qquad=-8\end{array}$$

$a=8$

$8-2b=-1$

$b=4.5$

Feb 10-5:18 PM