

September 1, 2026

National Burnt Ends Day

Today in History:

Aaron Burr acquitted (1807)

Wreck of the Titanic found (1985)

Number of the Day: 84

$$84 = 2 \times 2 \times 3 \times 7$$

84 is the smallest number with eight representations as a sum of two primes.

Fun Fact:

The French language has seventeen different words for 'surrender'.

Quote of the Day:

"First the doctor told me the good news: I was going to have a disease named after me."

-Steve Martin

Today's Weather:

A stray shower or thunderstorm is possible, high 86°.

Math 121

Quiz #5

Find

$$\lim_{x \rightarrow -1} \frac{x^2 + 1}{(x^3 + 2)(x^4 + 1)}$$

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

CONTINUITY

WE SAY $f(x)$ IS CONT AT

$$x=c$$

① $\lim_{x \rightarrow c} f(x)$ EXISTS

② $f(c)$ EXISTS

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

Examp LE

$$f(x) = 3$$

$$\text{AT } x = 2$$

$$\textcircled{1} \lim_{x \rightarrow 2} f(x) = \lim_{x \rightarrow 2} 3 = 3 \quad \checkmark$$

$$\textcircled{2} f(2) = 3 \quad \checkmark$$

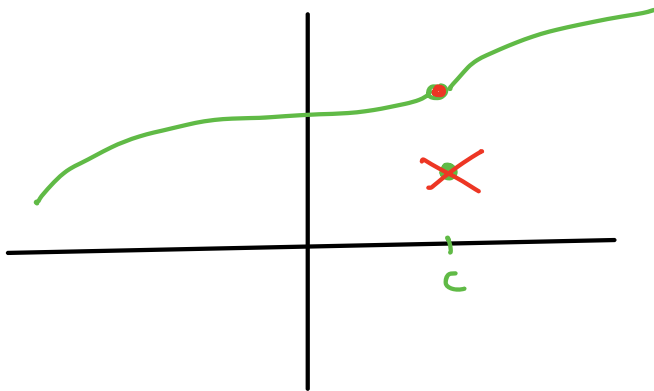
$$\textcircled{3} \lim_{x \rightarrow 2} f(x) = f(2) \\ \parallel \\ 3 = 3 \quad \checkmark$$

TYPES OF DISCONT.

① REMOVABLE.

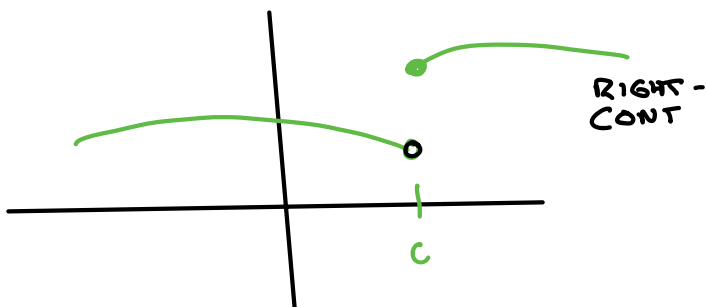
$$\lim_{x \rightarrow c} f(x) \text{ EXIST}$$

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



② JUMP DISCONT.

$$\lim_{x \rightarrow c^-} f(x) \neq \lim_{x \rightarrow c^+} f(x) \\ \parallel \quad \parallel \\ \text{EXIST} \quad \text{EXIST}$$



ONE - SIDE CONT.

LEFT - CONT $\lim_{x \rightarrow c^-} f(x) = f(c)$

RIGHT - CONT $\lim_{x \rightarrow c^+} f(x) = f(c)$

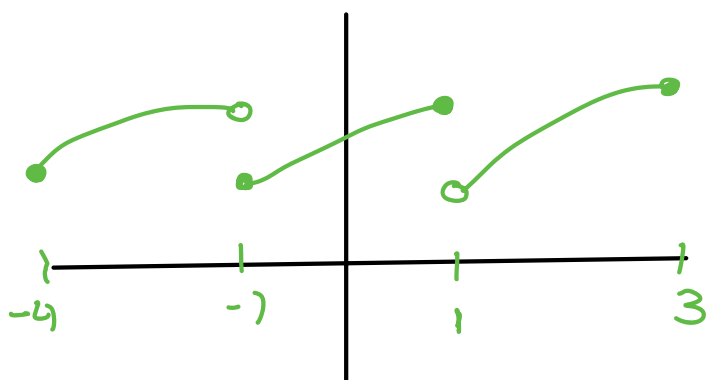
$f(x) = \sqrt{x}$ IS CONT AT $x=0$

$$\lim_{x \rightarrow 0} \sqrt{x} = \text{DNE.}$$

$f(x) = \sqrt{x}$ IS RIGHT CONT. AT $x=0$

$$\lim_{x \rightarrow 0^+} \sqrt{x} = 0$$

(a, b)	$a < x < b$	
$[a, b]$	$a \leq x \leq b$ PLUS	RIGHT CONT $x=a$ LEFT CONT $x=b$
$(a, b]$	$a < x \leq b$ PLUS	LEFT CONT $x=b$
$[a, b)$	$a \leq x < b$ PLUS	RIGHT CONT $x=a$



$[-4, -1)$ $[-1, 1]$ $(1, 3]$

$f(x)$ & $g(x)$ ARE CONT.

① $f(x) + g(x)$

② $f(x) \cdot g(x)$

③ $k f(x)$

④ $\frac{f(x)}{g(x)}$ EXCEPT $g(x) = 0$

⑤ POLYNOMIALS ARE CONT.

⑥ RATIONAL ARE CONT $\frac{P(x)}{Q(x)}$

$Q(x) \neq 0$

⑦ $\sin x$

⑧ $\cos x$

⑨ b^x $b > 0$

⑩ $f^{-1}(x)$

⑪ $\log_b x$ $x > 0$

⑫ $(f \circ g)(x)$

EXAMPLES

WHERE ARE THESE CONT?

$$\textcircled{1} \quad f(x) = x^2 + \cos x$$

$$\textcircled{2} \quad f(x) = \frac{1}{x^2 - 1} \quad x \neq \pm 1$$

$$\textcircled{3} \quad f(x) = \frac{x^2 - 4}{x - 2} \quad x \neq 2$$

PIECE - WISE FUNCTIONS

$$f(x) = \begin{cases} x+1 & x \leq 0 \\ x^2+1 & x > 0 \end{cases}$$

$$f(2) = 5 \quad f(-1) = 0$$

IS IT CONT AT $x=0$

$$\lim_{x \rightarrow 0^-} f(x) = \lim_{x \rightarrow 0^-} x+1 = 1$$

$$\lim_{x \rightarrow 0^+} f(x) = \lim_{x \rightarrow 0^+} x^2+1 = 1$$

$$\lim_{x \rightarrow 0} f(x) = 1$$

//

CONT

$$f(0) = 1$$

FIND a SO THAT

$$f(x) = \begin{cases} x^3 & x < 2 \\ ax^2 & x \geq 2 \end{cases} \quad \text{IS CONT}$$

$$\lim_{x \rightarrow 2^-} f(x) = \lim_{x \rightarrow 2^-} x^3 = 8$$

$$\lim_{x \rightarrow 2^+} f(x) = \lim_{x \rightarrow 2^+} ax^2 = 4a$$

$$8 = 4a \quad a = 2$$

$$f(2) = 2(2^2) = 8$$

FIND a AND b SO THAT

$$f(x) = \begin{cases} 2 & x < -1 \\ ax+b & -1 \leq x < 2 \\ -2 & x \geq 2 \end{cases}$$

$$x = -1 \quad \lim_{x \rightarrow -1^-} f(x) = \lim_{x \rightarrow -1^-} 2 = 2$$

$$\lim_{x \rightarrow -1^+} f(x) = \lim_{x \rightarrow -1^+} ax+b = -a+b$$

$$\underline{-a+b=2}$$

$$x = 2 \quad \lim_{x \rightarrow 2^-} f(x) = \lim_{x \rightarrow 2^-} ax+b = 2a+b$$

$$\lim_{x \rightarrow 2^+} f(x) = \lim_{x \rightarrow 2^+} -2 = -2$$

$$\underline{2a+b=-2}$$

$$\begin{array}{r} -a + b = 2 \\ -(2a + b = -2) \\ \hline -3a = 4 \end{array}$$

$$a = -\frac{4}{3}$$

$$\begin{array}{r} -(-\frac{4}{3}) + b = 2 \\ \frac{4}{3} + b = 2 \end{array}$$

$$b = \frac{2}{3}$$