September 3, 2025

Welsh Rarebit Day

Today in History:

Treaty of Paris Signed (1783)

Viking 2 Lands on Mars (1976)

Number of the Day: 775

775 = 5 x 5 x 31

$775 = 3^3 + 4^3 + 5^3 + 6^3 + 7^3$.

Fun Fact:

People who use more emojis have more sex and get more dates. ☺

Quote of the Day:

"Life is either a daring adventure or nothing at all."

- Helen Keller

Today's Weather:

Sunny to partly cloudy, high 81^o.

Math 121

Quiz #5

If $\lim_{x \to -4} f(x) = 3$ and $\lim_{x \to -4} g(x) = 4$,

find

$$\lim_{x \to -4} \frac{f(x) + 1}{3\,g(x) - 9}$$

$= \dfrac{3+1}{12-9} = \dfrac{4}{3}$

Pg 78 #9

$\lim_{x \to -1} (3x^4 - 2x^3 + 4x) = 3 + 2 - 4$

$= 1$

MPOD #4
5

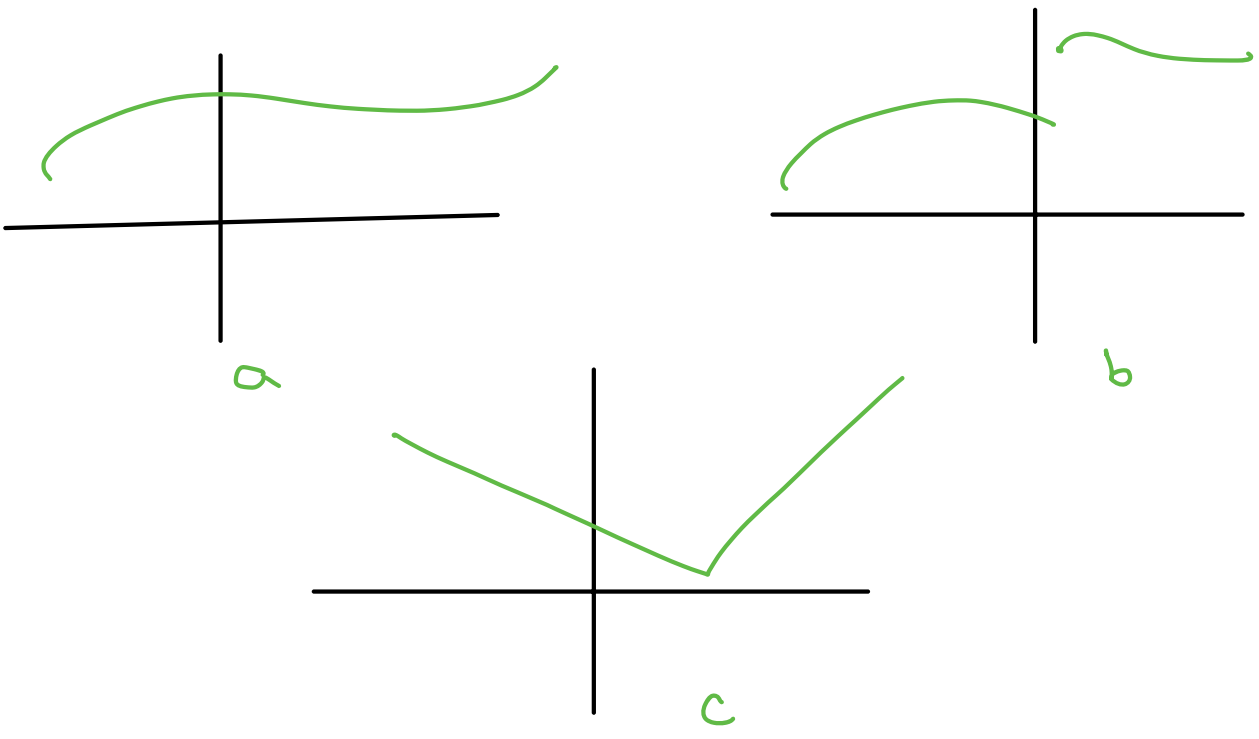
$$\lim_{x \to 0} \frac{\sin x}{x}$$

x	$\frac{\sin x}{x}$
.1	.998
.01	.9999
.0001	.99999...

$= 1$

CONTINUITY

WE SAY $f(x)$ IS CONT.



AT $x = c$ IF

① $\lim_{x \to c} f(x)$ EXISTS

② $f(c)$ EXISTS

→ ③ $\lim_{x \to c} f(x) = f(c)$

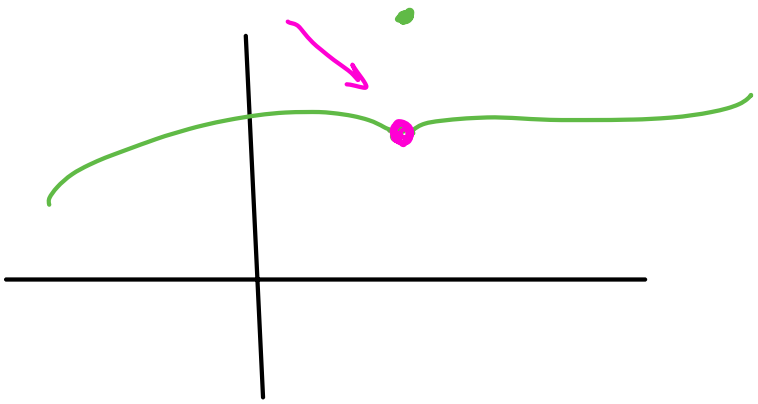
EXAMPLE

→ $f(x) = 3$ AT $x = 2$

① $\lim_{x \to 2} f(x) = 3$

② $f(2) = 3$

③ $\lim_{x \to 2} f(x) = f(2)$ ✓ YES.



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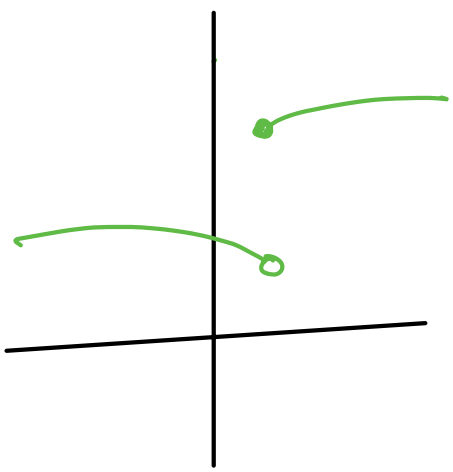

JUMP

ONE-SIDE CONT.

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

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

EXAMPLE $f(x) = \sqrt{x}$

IS IT CONT AT $x = 0$?

$\lim_{x \to 0} \sqrt{x}$ ~~$\lim_{x \to 0^-} \sqrt{x}$~~

$\lim_{x \to 0^+} \sqrt{x}$ RIGHT-CONT

CONT ON INTERVAL

(a, b) OPEN

$[a, b]$ CLOSED

$(a, b]$

$[a, b)$

WHICH FUNCTIONS ARE CONT.

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

POLYNOMIALS

RATIONAL $\frac{P(x)}{Q(x)}$ $Q(x) \neq 0$

SUM OF CONT. $f(x) \pm g(x)$

PROD. $f(x) \cdot g(x)$

QU. $\frac{f(x)}{g(x)}$ $g(x) \neq 0$

$\sin x$, $\cos x$, b^x $(b > 0)$, $\log_b x$ $(x > 0)$

$(f \circ g)(x)$

EXAMPLES

① $f(x) = x^2 + \cos x$ $\quad \forall x$

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

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

PIECE-WISE FUNCTIONS

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

$f(-2) = -2+1 = -1$

$f(3) = 3^2 + 1 = 10$

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

WHAT VALUE OF a MAKES $f(x)$ CONT.?

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

$\lim_{x \to 2^-} f(x) = 8$ $\quad \lim_{x \to 2^+} f(x) = 4a$

$8 = 4a$ $\quad \boxed{a = 2}$

FIND a AND b SO THAT

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

CONT.

PROB. SPOTS ARE $x = -1$, $x = 2$

$f(-1) = -a + b$

$f(2) = -2$

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

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

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

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

$2(-a + b = 2)$

$2a + b = -2$

$-2a + 2b = 4$

$3b = 2$

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

$2a + \frac{2}{3} = -2$

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