

September 11, 2026

National Hot Cross Bun Day

Today in History:

9/11 (2001)

Scottish rebel William Wallace defeated English forces at the Battle of Stirling Bridge. (1297)

Number of the Day: 2311

2311 is prime

2311 is a Euclid Number

Fun Fact:

If a Polar Bear and a Grizzly Bear mate, their offspring is called a "Pizzly Bear".

Quote of the Day:

"The only way to get rid of a temptation is to yield to it."

- Oscar Wilde

Today's Weather:

Sunshine and clouds mixed, high 75°

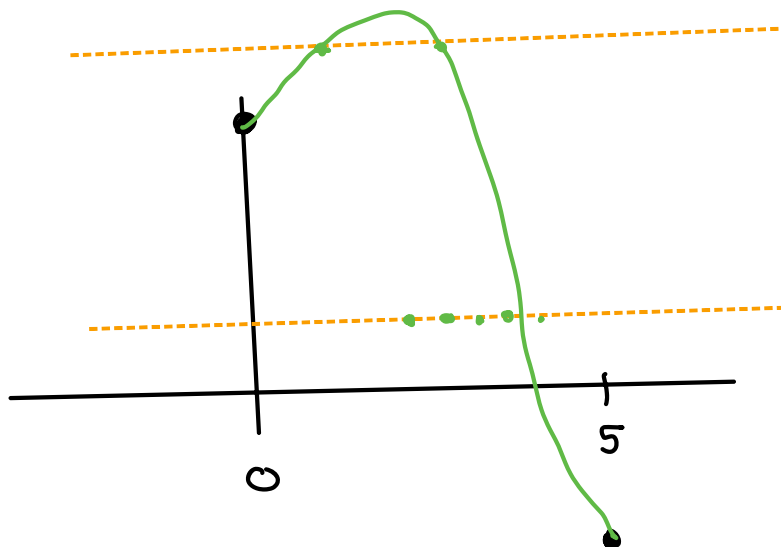
Math 121

Quiz #10

If $f(x)$ is continuous on $[0, 5]$ and $f(0) = 4$ and $f(5) = -2$.

For each of the following statements, say whether it is always true (AT), never true (NT), or sometimes true (ST):

1. $f(c) = 1$ has a solution with $0 < c < 5$ (AT)
2. $f(c) = 1$ has only one solution with $0 < c < 5$ (ST)
3. $f(c) = 6$ has a solution with $0 < c < 5$ (ST)



* 9 $\sqrt{2}$ EXISTS

$$f(x) = x^2$$

$$f(\sqrt{2}) = 2$$

$$x^2 = 2$$

fun is CONT

$$f(0) = 0$$

$$f(2) = 4$$

SINCE

$$0 < 2 < 4$$

*6 mPOD

$$f(x) = x^3 - 3x^2 + 1$$

$$f(-3) = -53$$

$$f(-2) = -19$$

$$f(-1) = -3$$

$$f(0) = 1$$

$$f(1) = -1$$

$$f(2) = -3$$

$$f(3) = 1$$

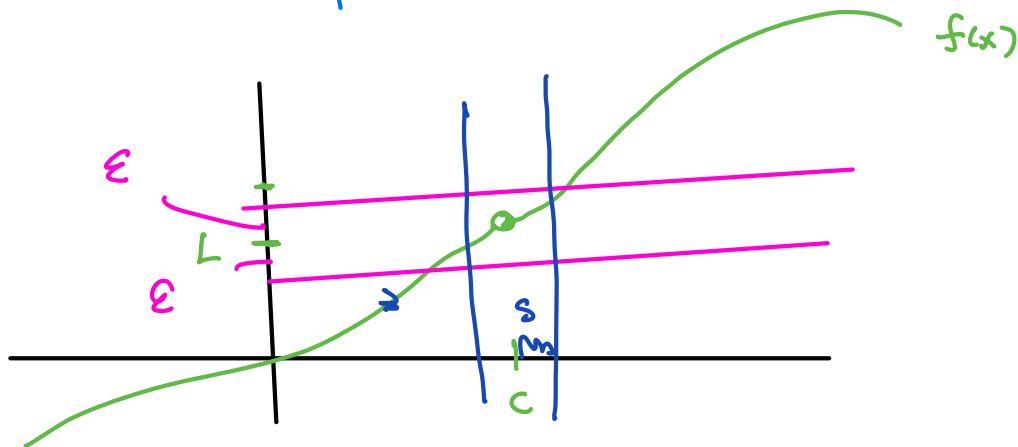
LIMITS

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

GIVEN ANY $\epsilon > 0$, THERE EXISTS
A $\delta > 0$ SUCH THAT IF

$$0 < |x - c| < \delta \quad \text{THEN}$$

$$\rightarrow |f(x) - L| < \epsilon$$



EXAMPLE

$$\lim_{x \rightarrow 2} (3x+1) = 7$$

GIVEN $\epsilon = .1$

$$|f(x) - L| < \epsilon$$

$$|3x+1 - 7| < .1$$

$$|3x - 6| < .1$$

$$|3(x-2)| < .1$$

$$|x-2| < \frac{.1}{3}$$

$$\delta = \frac{.1}{3}$$

$$|x - c| < \delta$$

GIVEN $\epsilon = .0000001$

$$|f(x) - L| < \epsilon$$

$$|3x+1 - 7| < .0000001$$

$$|3x - 6| < .0000001$$

$$|3(x-2)| < .0000001$$

$$|x-2| < \frac{.0000001}{3}$$

$$\delta = \frac{.0000001}{3}$$

GIVEN ϵ

$$|x-2| < \frac{\epsilon}{3}$$

$$|f(x) - L| < \epsilon$$

$$|3x+1 - 7| < \epsilon$$

$$|3x - 6| < \epsilon$$

$$|3(x-2)| < \epsilon$$

PROVE $\lim_{x \rightarrow 2} (3x+1) = 7$

GIVEN ANY $\varepsilon > 0$ LET $\delta = \frac{\varepsilon}{3}$

THEN $0 < |x-2| < \delta$
 $|x-2| < \frac{\varepsilon}{3}$

$$|3(x-2)| < \varepsilon$$

$$|3x-6| < \varepsilon$$

$$|3x+1-7| < \varepsilon \quad \checkmark$$

$\lim_{x \rightarrow 2} 5x+1 = 11$
 $x \rightarrow 2$

$$|5x+1-11| < \varepsilon$$

$$|5x-10| < \varepsilon$$

$$|5(x-2)| < \varepsilon$$

$$|x-2| < \frac{\varepsilon}{5}$$

$$\text{LET } \delta = \frac{\varepsilon}{5}$$

PROVE

GIVEN $\varepsilon > 0$

$$\text{LET } \delta = \frac{\varepsilon}{5}$$

$$0 < |x-2| < \delta$$

$$|x-2| < \frac{\varepsilon}{5}$$

$$|5(x-2)| < \varepsilon$$

$$|5x-10| < \varepsilon$$

$$|5x+1-11| < \varepsilon \quad \checkmark$$

EXAMPLE 3

$$\lim_{x \rightarrow 1} x^2 = 1$$

$$|x^2 - 1| < \varepsilon$$

$$|(x-1)(x+1)| < \varepsilon$$

$$x < 2$$

$$x+1 < 2+1 = 3$$

$$|(x-1)(x+1)| < \underbrace{|(x-1)(3)|}_{< \varepsilon} < \varepsilon$$

$$|x-1| < \frac{\varepsilon}{3}$$

$$\delta = \frac{\varepsilon}{3}$$

PROOF

GIVEN $\varepsilon > 0$ LET $\delta = \frac{\varepsilon}{3}$

THEN IF $|x-1| < \delta$

$$|x-1| < \frac{\varepsilon}{3}$$

$$|3(x-1)| < \varepsilon$$

$$|(x+1)(x-1)| < \varepsilon$$

$$|x^2 - 1| < \varepsilon$$



SINCE
 $0 < x < 2$
 $\hline 1 < x+1 < 3$