September 10, 2025

International Suicide Prevention Day

Today in History:

First drunk driving arrest (1897)

The Battle of Lake Erie (1813)

Number of the Day: 517

517 is prime

517 is the index of a prime Fibonacci Number.

Fun Fact:

Half of all Americans live within 50 miles of their birthplace.

Quote of the Day:

"You can avoid reality, but you cannot avoid the consequences of avoiding reality."

- Ayn Rand

Today's Weather:

Plenty of sunshine, high 75°

Math 121

Quiz #9

Find

$$\lim_{x\to-\infty} \frac{8x^2+7x}{\sqrt{9x^4+6x}} = \frac{8}{3}$$

Pg 106

#23

$$g(t) = \frac{10}{1+3^{-t}}$$

$$\lim_{t\to+\infty} \frac{10}{1+3^{-t}} = 10 \qquad \lim_{t\to-\infty} \frac{10}{1+3^{-t}} = 0$$

$$\lim_{t\to+\infty} 3^{-t} = 0 \qquad \lim_{t\to-\infty} 3^{-t} = +\infty$$

DNE

#13

$$\lim_{x\to-\infty} \frac{7x^2-9}{4x+3} = \text{DNE}. \quad (-\infty)$$

#21 $f(t) = \dfrac{e^t}{1+e^{-t}}$

$$\lim_{t \to \infty} \frac{e^t}{1+e^{-t}} = \text{DNE} = +\infty \qquad \lim_{t \to -\infty} \frac{e^t}{1+e^{-t}} = 0$$

$$\lim_{t \to \infty} e^t = +\infty \qquad \lim_{t \to -\infty} e^t = 0$$

$$\lim_{t \to \infty} e^{-t} = 0 \qquad \lim_{t \to -\infty} e^{-t} = +\infty$$

MPOD #8 $\displaystyle \lim_{x \to \infty} \left(\frac{2x}{3x+1} - \frac{x^2}{x-3} \right)$

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

$$= \lim_{x \to \infty} \frac{2x^2 - 6x - 3x^3 - x^2}{(3x+1)(x-3)} = \text{D.N.E.}$$

#9 $\displaystyle \lim_{x \to \infty} \left(x - \sqrt{x^2+x}\right)\left(\frac{x+\sqrt{x^2+x}}{x+\sqrt{x^2+x}}\right)$

$$= \lim_{x \to \infty} \frac{\cancel{x^2} - (\cancel{x^2}+x)}{1x + \sqrt{1x^2+x}} = \frac{-1}{2}$$

$-x$

I.V.T.

$f(x)$ IS CONT. ON $[a, b]$

$f(a) \neq f(b)$ THEN

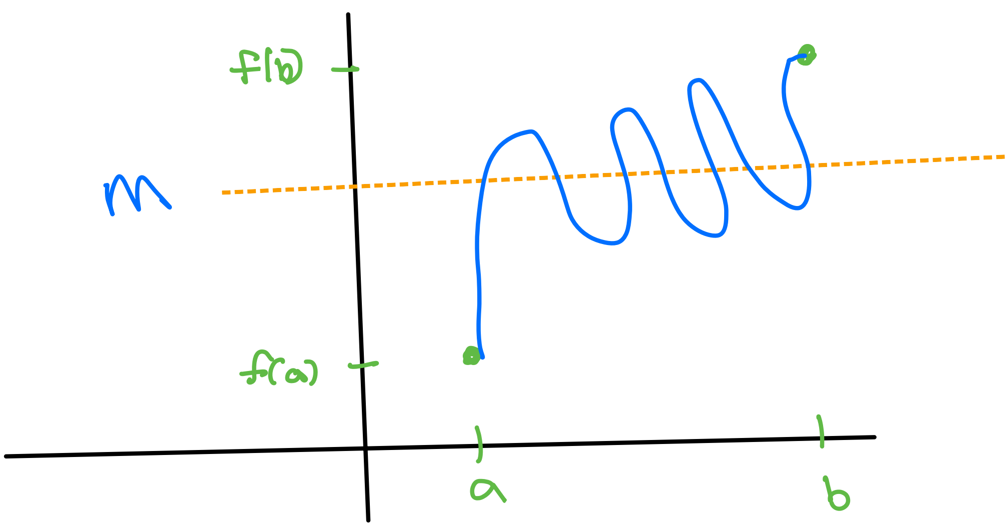
$f(a) < M < f(b)$

OR $f(b) < M < f(a)$

M IS BETWEEN $f(a)$ AND $f(b)$

THERE IS A C $a < c < b$

$f(c) = M$



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

SHOW THERE IS A C $0 < c < 5$

$f(c) = 11$

$[0, 5]$ IS $f(x)$ CONT? ✓

$f(0) = -1$ $f(5) = 29$

IS 11 BETWEEN -1 AND 29

$$c^2 + c - 1 = 11 \qquad 0 < c < 5$$

$$c^2 + c - 12 = 0$$

$$(c+4)(c-3) = 0 \qquad c = -4, \boxed{3}$$

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

SHOW THERE IS A c $\quad 0 < c < 1$

WHERE $f(c) = 0$

IS $f(x)$ CONT.?

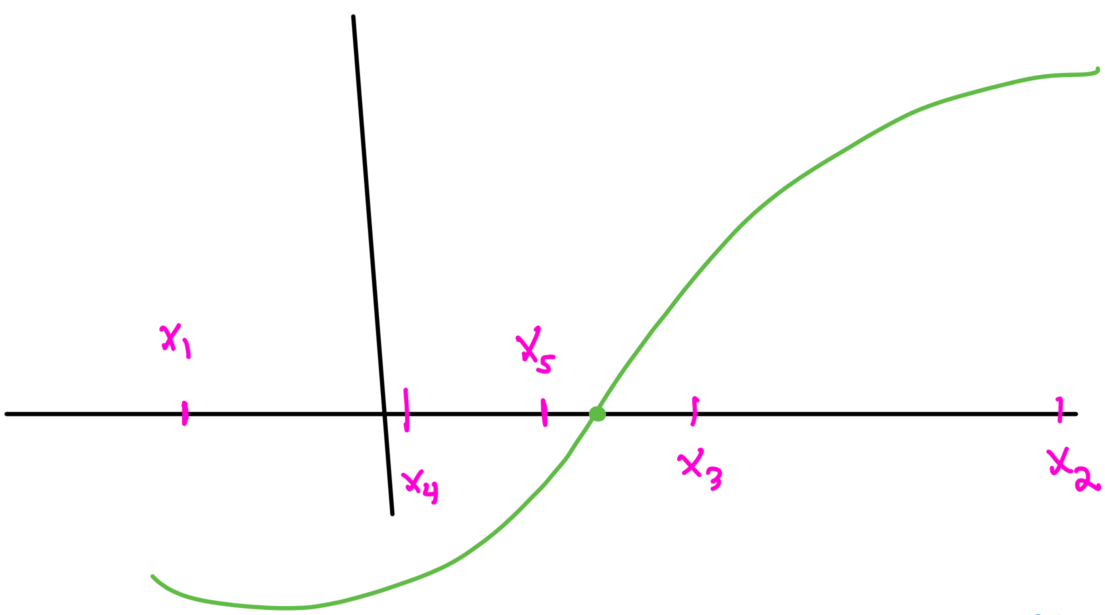
$f(0) = -1 \qquad f(1) = 2$

IS 0 BETWEEN -1 AND 2?

$c \approx .4534 \ldots$

BISECTION METHOD

$f(x) = 0$



$f(x_2) > 0$

$f(x_1) < 0$

$$x_3 = \frac{x_1 + x_2}{2}$$

$$x_4 = \frac{x_1 + x_3}{2}$$

$\underline{f(x_3) > 0}$ $f(x_1) < 0$

$f(x_4) < 0$

EXAMPLE

$f(x) = x^2 - 2$ $f(x) = 0$

$[1, 2]$ $f(1) = -1$ $f(2) = 2$

$x_1 = 1$

$x_2 = 2$

$$x_3 = \frac{1+2}{2} = 1.5$$

$$x_4 = \frac{1 + 1.5}{2} = 1.25$$

$$x_5 = \frac{1.25 + 1.50}{2} = 1.375$$

$$x_6 = \frac{1.375 + 1.5}{2} = 1.4375$$

$$x_7 = \frac{1.375 + 1.4375}{2} = 1.40\ldots$$

$f(1) = -1$

$f(2) = 2$

$f(1.5) = \underline{1.25}$

$f(1.25) = \underline{-.4375}$

$f(1.375) = -.11$

$f(1.4375) > 0$

$f(1.40\ldots) < 0$