

September 9, 2026

National Teddy Bear Day

Today in History:

Congress renames the nation "United States of America" (1776)

California becomes the 31st state (1850)

Number of the Day: 712

$712 = 2 \times 2 \times 2 \times 89$

712 is the sum of the first 21 primes.

Fun Fact:

It is illegal for men to wear strapless dresses in Miami, Florida.

Quote of the Day:

"Don't stay in bed, unless you can make money in bed."

- George Burns

Today's Weather:

Afternoon thundershowers, high 84°.

Math 121

Quiz #9

Find

$$\lim_{x \rightarrow -\infty} \frac{3x + 7}{\sqrt{16x^2 + 6}}$$

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

$$|x| = \begin{cases} x & x \geq 0 \\ -x & \underline{x < 0} \end{cases}$$

*10

$$\lim_{x \rightarrow -\infty} \frac{|x| - x}{x+1}$$

$$= \lim_{x \rightarrow -\infty} \frac{-x - x}{x+1} = \lim_{x \rightarrow -\infty} \frac{-2x}{x+1} = -2$$

$$*9 \quad \lim_{x \rightarrow \infty} x - \sqrt{x^2 + x} \left(\frac{x + \sqrt{x^2 + x}}{x + \sqrt{x^2 + x}} \right)$$

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

$$= \lim_{x \rightarrow \infty} \frac{-x}{x + \sqrt{x^2 + x}} = -\frac{1}{2}$$

$$*7 \quad \lim_{x \rightarrow -\infty} \frac{2x}{\sqrt{x^2 + 1}} = -\frac{2}{1}$$

$$(23) \quad g(t) = \frac{10}{1 + 3^{-t}}$$

$$\lim_{t \rightarrow +\infty} \frac{10}{1 + 3^{-t}} = \frac{10}{1} = 10$$

$$y = 10$$

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

$$y = 0$$

I. V. T.

INTERMEDIATE VALUE THEOREM.

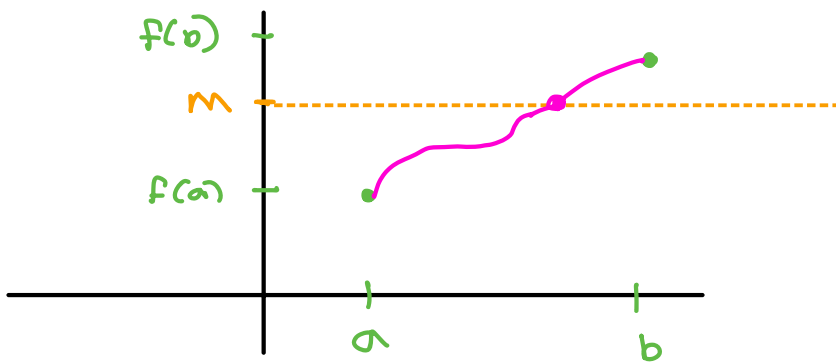
$f(x)$ IS CONT. ON $[a, b]$

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

THEN FOR ANY N BETWEEN $f(a)$

AND $f(b)$ THERE IS A c

WHERE $a < c < b$ AND $f(c) = M$



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

ON $[0, 5]$ $f(x) = 11$

$f(x)$ TO BE CONT. ✓

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

IS 11 BETWEEN -1 AND 29 ✓

$$f(c) = 11 \quad x^2 + x - 1 = 11$$

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

$$(x+4)(x-3) = 0$$

$$\cancel{x = -4} \quad \underline{\underline{x = 3}}$$

EXAMPLE $f(x) = x^3 + 2x - 1$ ON $[0, 1]$

$$f(x) = 0?$$

IS $f(x)$ CONT? ✓

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

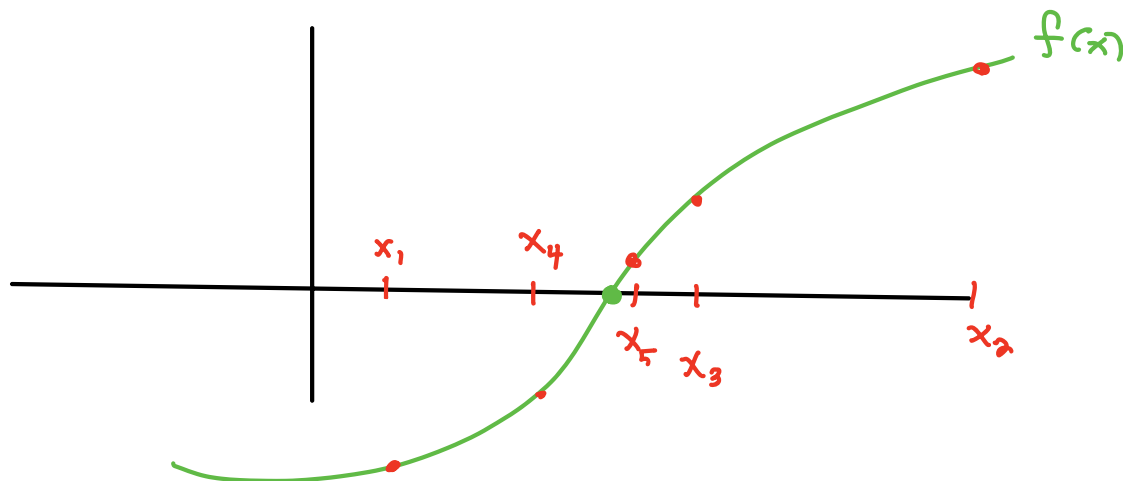
IS 0 BETWEEN -1 AND 2 ✓

$$f(c) = 0$$

$$x \approx .45340 \dots$$

$f(x) = 0$ ROOT OF A FUNCTION.

BISECTION METHOD.



$$\begin{aligned} &\rightarrow f(x_1) < 0 \\ &\quad f(x_2) > 0 \\ &\rightarrow f(x_2) > 0 \\ &\quad f(x_4) < 0 \\ &\quad f(x_5) > 0 \end{aligned}$$

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

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

$$x_5 = \frac{x_3 + x_4}{2}$$

EXAMPLE

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

$$x_1 = 1 \quad x_2 = 2$$

$$\rightarrow f(1) = 1 - 2 = -1$$

$$f(2) = 2$$

$$f(1.5) = .25$$

$$f(1.25) = -.4375$$

$$x_3 = \frac{x_1 + x_2}{2} = \frac{1 + 2}{2} = 1.5$$

$$x_4 = \frac{x_1 + x_3}{2} = \frac{1 + 1.5}{2} = 1.25$$