October 27, 2026

National American Beer Day

Today in History:

New York City subway opens (1904)

King George III speaks to Parliament of American rebellion (1775)

Number of the Day: 140

140 = 2 x 2 x 5 x 7

140 is a square pyramidal number.

Fun Fact:

Cyclophobia is the fear of bicycles.

Quote of the Day:

“I had rather be right than be President.”

-Henry Clay

Today’s Weather:

Partly to mostly cloudy, high near 66^{o}.

Math 121 - Quiz #30

Find

$$\lim_{x\to 0} \frac{e^{2x}-2x-1}{3x^2} = \text{"}\frac{0}{0}\text{"}$$

$$\lim_{x\to 0} \frac{2e^{2x}-2}{6x} = \text{"}\frac{0}{0}\text{"}$$

$$\lim_{x\to 0} \frac{4e^{2x}}{6} = \frac{4}{6} = \frac{2}{3}$$

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mpod # 12

$$y = \lim_{x\to 0} (1+x)^{\frac{1}{x}} = \text{"}1^{\infty}\text{"}$$

$$\ln y = \ln \lim_{x\to 0} (1+x)^{\frac{1}{x}}$$

$$= \lim_{x\to 0} \ln(1+x)^{\frac{1}{x}}$$

$$= \lim_{x\to 0} \frac{\ln(1+x)}{x} = \frac{0}{0}$$

$$\lim_{x\to 0} \frac{\frac{1}{1+x}}{1} = 1$$

$$\ln y = 1 \qquad y = e^1 = e$$

#16 $$\lim_{x\to\infty} \left(1 - \frac{3}{x}\right)^x = 1^\infty$$

$$y = \lim_{x\to\infty} \left(1 - \frac{3}{x}\right)^x$$

$$\ln y = \ln \lim_{x\to\infty} \left(1 - \frac{3}{x}\right)^x$$

$$= \lim_{x\to\infty} x \ln\left(1 - \frac{3}{x}\right)$$

$$= \lim_{x\to\infty} \frac{\ln\left(1 - \frac{3}{x}\right)}{\frac{1}{x}} = \frac{0}{0}$$

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

$$\ln y = -3 \qquad y = e^{-3}$$

* 9 $\lim_{x\to 0} \frac{e^x - 1}{x^3} = \frac{"0"}{0}$

$\lim_{x\to 0} \frac{e^x}{3x^2} = \frac{1}{0} =$ D.N.E.

Pg 252 * 15 $\lim_{x\to -\infty} \frac{\ln(x^4+1)}{x} = \frac{"\infty"}{\infty}$

$\lim_{x\to -\infty} \frac{\frac{4x^3}{x^4+1}}{} = \frac{"\infty"}{\infty}$

$= 0$

GRAPHING.

1 – 4 $f(x)$

5 – 7 $f'(x)$

8 – 10 $f''(x)$

EXAMPLE: $f(x) = 3x^5 - 5x^3$

DOMAIN: ALL x

RANGE: SAVE FOR LATER

x-INT.: $y = 0$ $\quad 0 = 3x^5 - 5x^3$

$= x^3(3x^2 - 5)$

$x^3 = 0$ $\qquad 3x^2 - 5 = 0$

$x = 0$ $\qquad x = \pm\sqrt{\frac{5}{3}}$

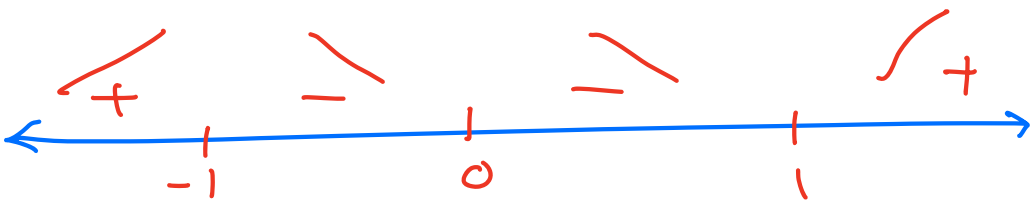
Y-INT: $x = 0$ $\qquad 3(0)^5 - 5(0)^3 = 0$

$y = 0$

$f'(x) = 15x^4 - 15x^2$

$15x^2(x^2 - 1) = 0$

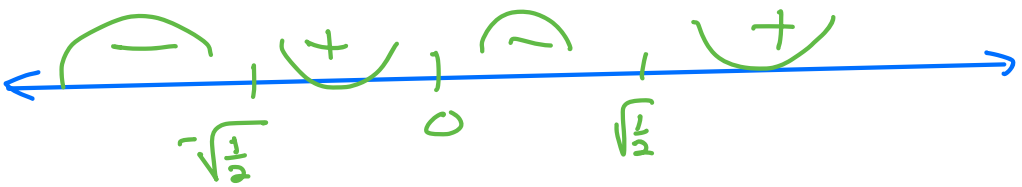
$x = 0$ $\qquad x = \pm 1$



$f''(x) = 60x^3 - 30x$

$30x(2x^2 - 1) = 0$

$x = 0$ $\qquad x = \pm\sqrt{\frac{1}{2}}$

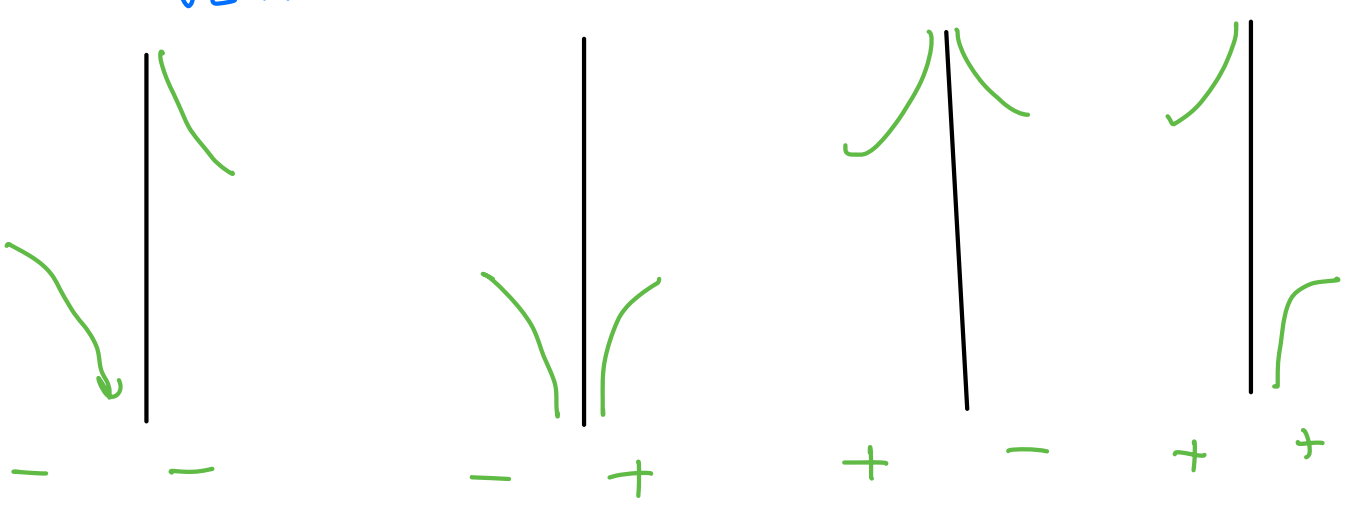


ASYMPTOTES

VERTICAL A. $\qquad f(x) = \frac{P(x)}{Q(x)}$ $\qquad Q(x) = 0$, $P(x) \neq 0$

HORIZONTAL A $\qquad \lim_{x \to \pm\infty} f(x) = L$

VERTICAL AS.



$$f(x) = \frac{x^2+1}{x^2-4}$$

H.A. $\lim_{x \to \pm\infty} \frac{x^2+1}{x^2-4} = 1$ $\quad y = 1$

VA: $x^2 - 4 = 0$ $\quad x = \pm 2$

DOMAIN: $x \neq \pm 2$

RANGE: SAVE FOR LATER

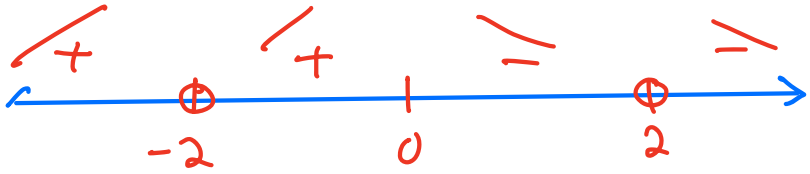
X-INT: $y = 0$ $\quad \frac{x^2+1}{x^2-4} = 0$ NO WHERE

Y-INT $x = 0$ $\quad \frac{0^2+1}{0^2-4} = -\frac{1}{4}$ $\quad y = -\frac{1}{4}$

$$f'(x) = \frac{(x^2-4)(2x) - (x^2+1)(2x)}{(x^2-4)^2} = \frac{-10x}{(x^2-4)^2}$$

$= 0$ $\quad -10x = 0$ $\quad x = 0$

UND. $\quad (x^2-4)^2 = 0$ $\quad x^2 - 4 = 0$ $\quad x = \pm 2$



INC: $(-\infty, -2) \cup (-2, 0)$

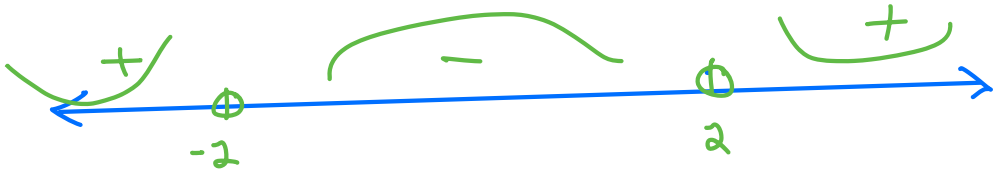
DEC: $(0, 2) \cup (2, \infty)$

CP. $x = 0$ MAX

$$f''(x) = \frac{30x^2 + 40}{(x^2 - 4)^3}$$

$30x^2 + 40 = 0$ NOWHERE

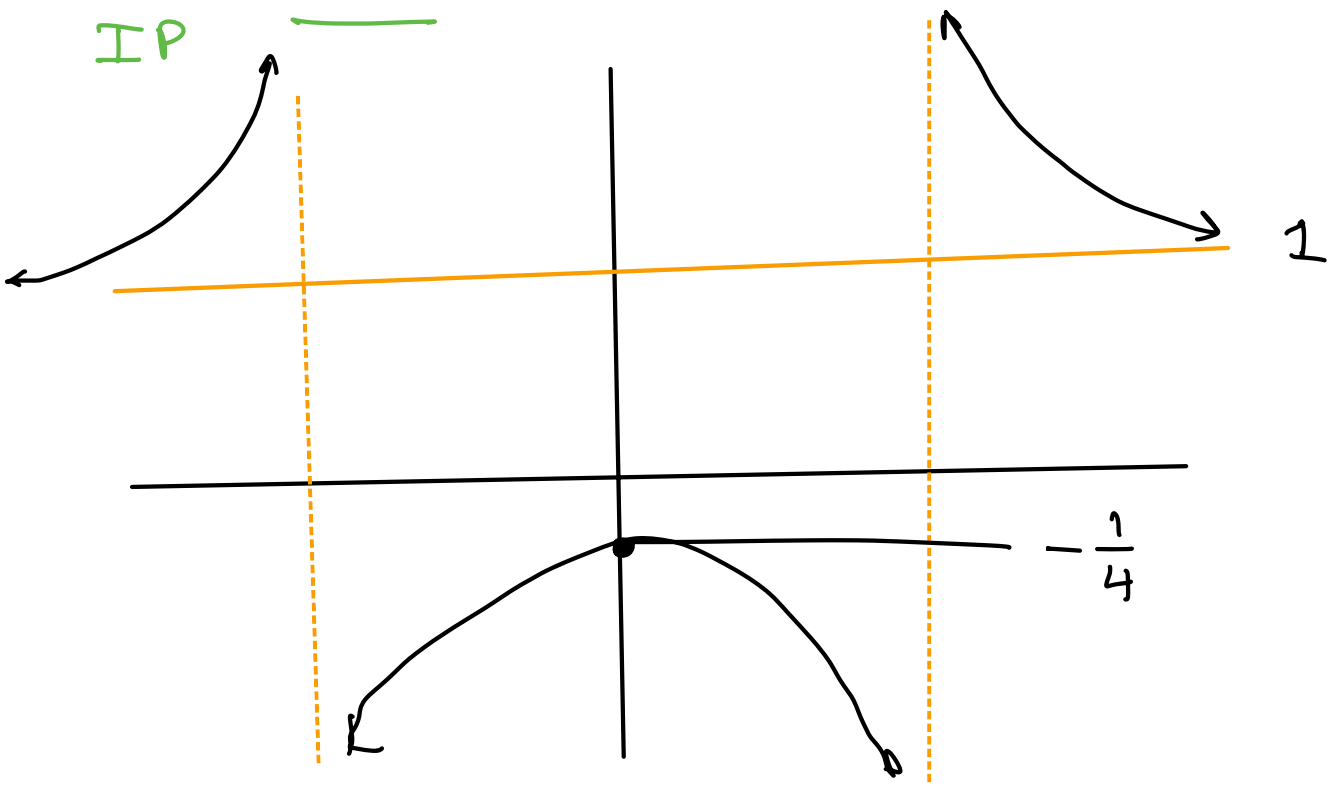
$(x^2 - 4)^3 = 0$ $x = \pm 2$

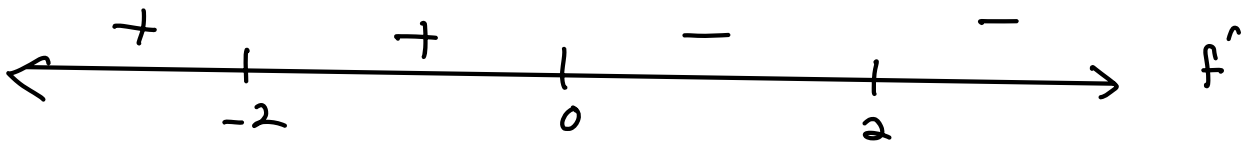


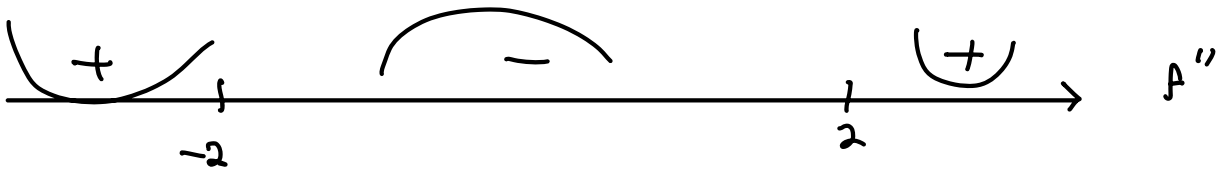
CONV UP $(-\infty, -2) \cup (2, \infty)$

CONV DN $(-2, 2)$

IP







RANGE $(-\infty, -\frac{1}{4}] \cup (1, \infty)$