MA121-002

Thursday, January 17

TA

OFFICE HOURS:

WILLIAM: M 12-1
W 12-1
SAS 3143

LINDSEY: MF 8:20 - 9:20
SAS 4119

$f(x) = 3x^2 - 4x - 2$

$V\left(\frac{2}{3}, \frac{-10}{3}\right)$

intercepts:

① y-int: $(x=0)$

$y = 3\cdot 0^2 - 4\cdot 0 - 2$

$(0, -2)$

② x-int: $(y=0)$

$0 = 3x^2 - 4x - 2$

quadratic formula

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$x = \frac{4 \pm \sqrt{(-4)^2 - 4(3)(-2)}}{2(3)}$$

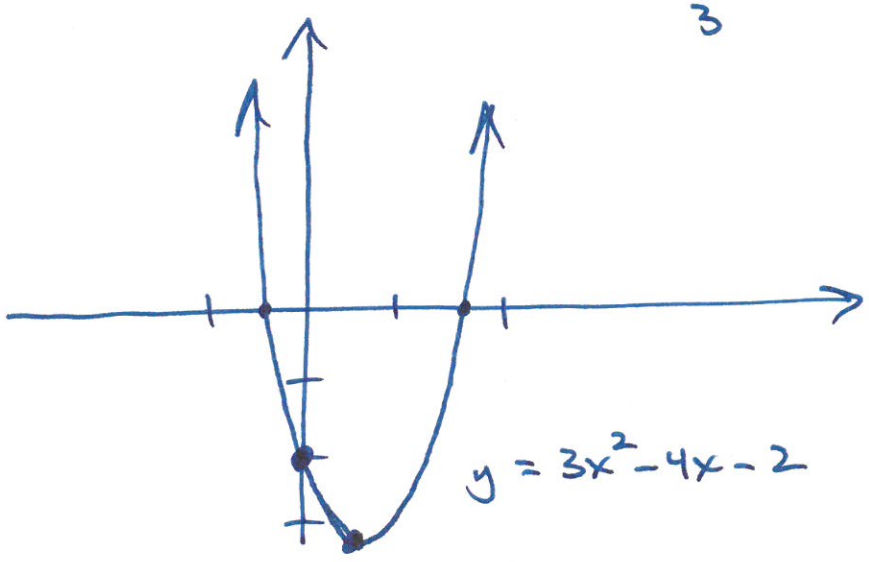
$$x = \frac{4 \pm \sqrt{16 + 24}}{6}$$

$$x = \frac{4 \pm \sqrt{40}}{6} = \frac{4 \pm \sqrt{4} \cdot \sqrt{10}}{6}$$

$$x = \frac{4 \pm 2\sqrt{10}}{6} = \frac{2(2 \pm \sqrt{10})}{2 \cdot 3}$$

$$x_1 = \frac{2+\sqrt{10}}{3} \approx 1.72$$

$$x_2 = \frac{2-\sqrt{10}}{3} \approx -.38$$



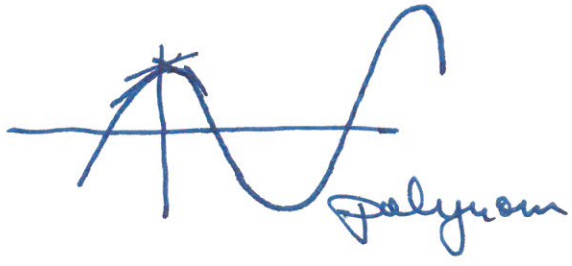
v $(2/3, -10/3)$
int: $(0, -2)$
int:

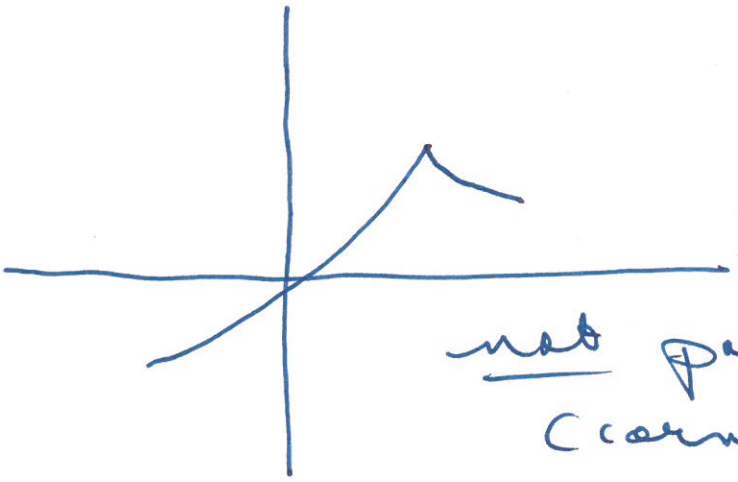
polynomial:

$$f(x) = a_n x^n + a_{n-1} x^{n-1} + a_{n-2} x^{n-2} + \ldots + a_2 x^2 + a_1 x^1 + a_0$$

exponents are NON-NEGATIVE INTEGERS

① continuous
② "smooth"





not polynom.
(corner; cusp)

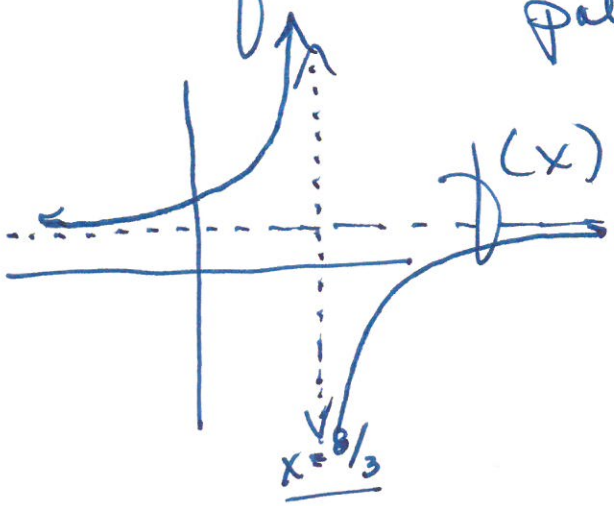
ex: $f(x) = 5x + 2$

$f(x) = 14x^8 - 7x^3 + 5x^1 - 11$

non-example: $f(x) = \sqrt{x} = x^{1/2}$

rational functions:

$$f(x) = \frac{\text{polynom}}{\text{polynom}} = \frac{2x+1}{3x-8}$$



$f(x) = \dfrac{2x+1}{3x-8}$

V.A.: $x = 8/3$

H.A.: & $y = 2/3$

$$\lim_{x\to\infty} \frac{2x+1}{3x-8} = \frac{2}{3}$$

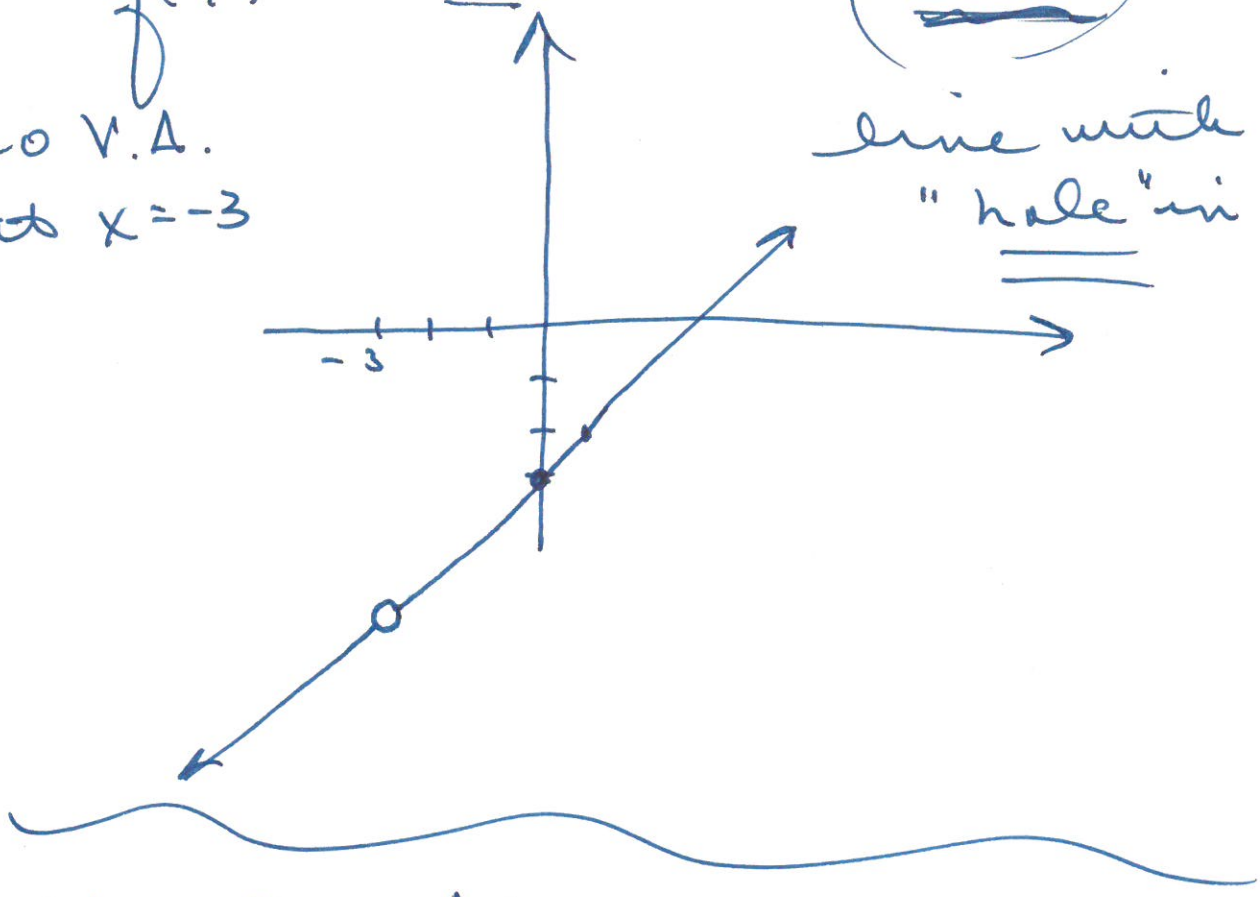
$$\lim_{x\to\infty} \frac{2 + \frac{1}{x} \to 0}{3 - \frac{8}{x} \to 0} = \frac{2}{3}$$

$$(4) = \frac{x^2-9}{x+3} = \frac{(x-3)(x+3)}{(x+3)} = x-3, \quad x \neq -3$$

$f(x) = x-3$

no V.A. at $x=-3$

line with a "hole" in it



Chapter 1:

1.1: LIMITS

"move half the distance to the wall"

LIMIT = WALL

$f(x) = 5x+1$

$$\lim_{x \to a} f(x) = L$$

"closer & closer"

$$\lim_{x \to 2} (5x+1) = ?? = 11$$

2-sided limit

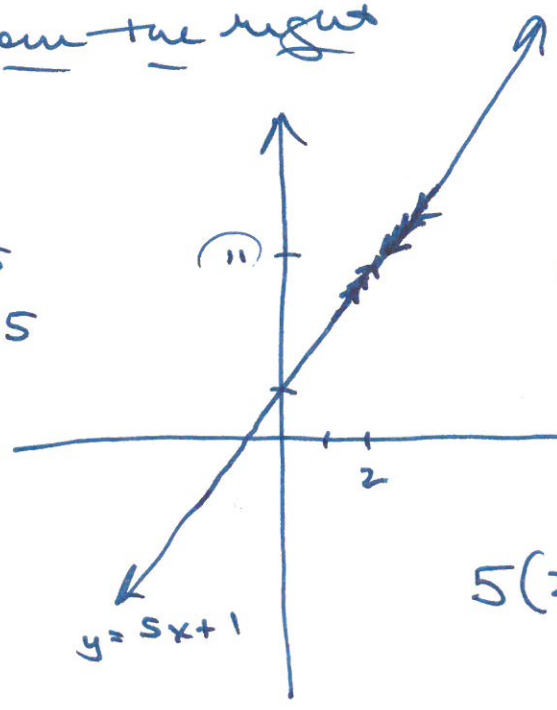
(1) $\lim_{x \to 2^+} (5x+1) = 11$ (2) $\lim_{x \to 2^-} (5x+1) = 11$

$x \to 2^+$ ↑ from the right

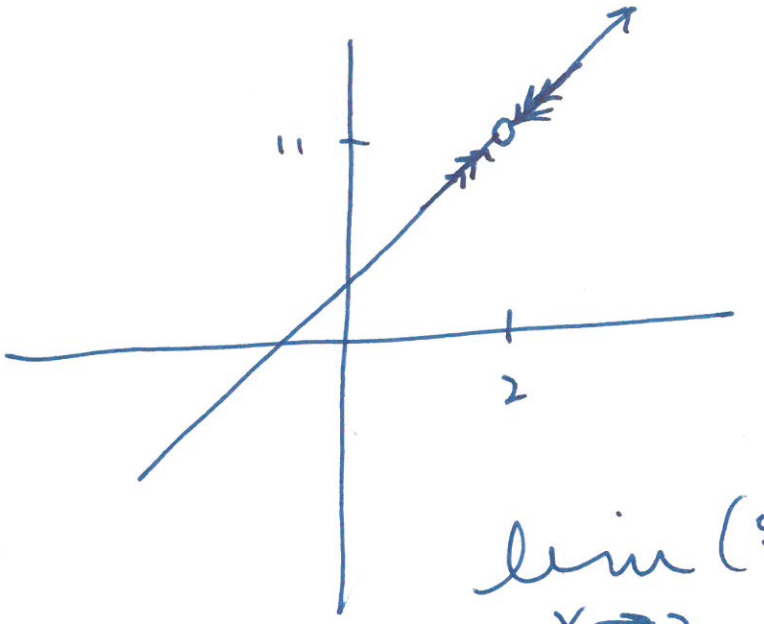
x	y
2.1	11.5
2.01	11.05
2.001	11.005
⋮	⋮
2	(11)

$x \to 2^-$ ↑ from the left

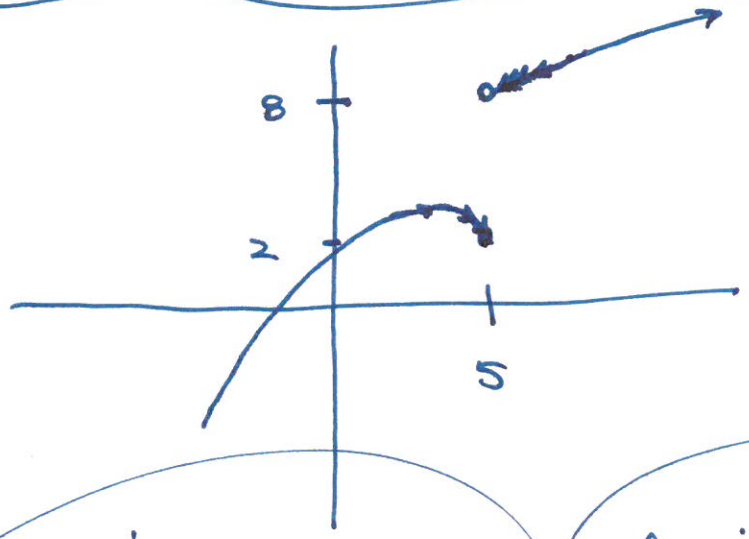
x	y
1.9	10.5
1.99	10.95
1.999	10.995
⋮	⋮
2	(11)



$5(2)+1 = 11$



$$\lim_{x \to 2} (5x+1) = 11$$



$$\lim_{x \to 5^+} f(x) = 8 \qquad \lim_{x \to 5^-} f(x) = 2$$

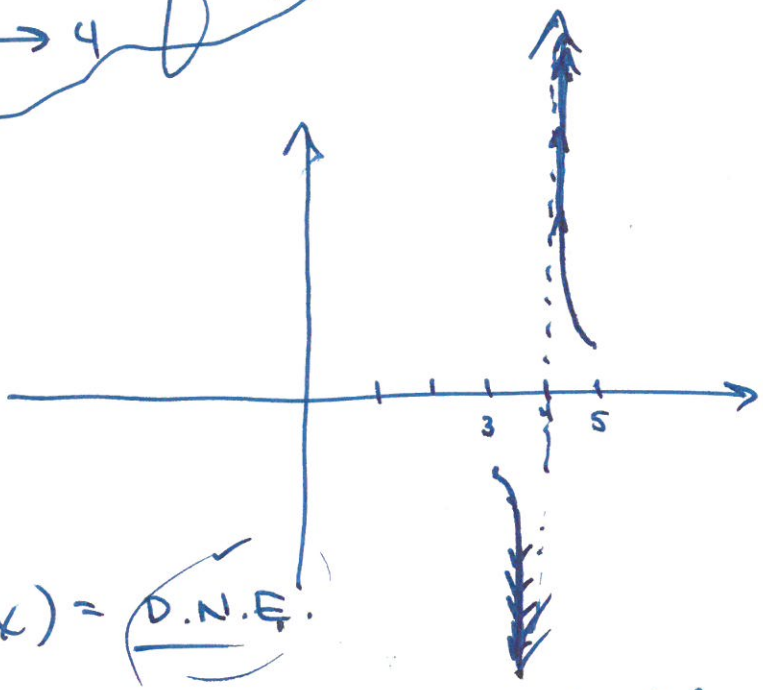
$$\lim_{x \to 5} f(x) = \text{D.N.E.}$$

(no limit)

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

V.A. : $x = 4$

$\lim_{x \to 4} f(x) =$ D.N.E. ✓✓



$\lim_{x \to 4^+} f(x) =$ D.N.E. ✓

$\left(\lim_{x \to 4^+} f(x) = +\infty \right)$

$\lim_{x \to 4^-} f(x) =$ D.N.E.

$\left(\lim_{x \to 4^-} f(x) = -\infty \right)$

$$\lim_{x\to\infty} \frac{f(x)}{g(x)}$$

$$y = \frac{2x+1}{5x^2-8x+3}$$

(1) $$\lim_{x\to\infty} \frac{2x^1+1}{5x^2-8x+3} = \frac{0}{\quad} = 0$$

H.A.: $y = 0$

$\frac{1}{5}$ . . . $\frac{2}{150}$ . . . $\frac{8}{100{,}000}$ . . . $\frac{11}{1{,}000{,}000{,}000}$

$$\lim_{x\to\infty} \frac{\frac{2x}{x^2} + \frac{1}{x^2}}{\frac{5x^2}{x^2} - \frac{8x}{x^2} + \frac{3}{x^2}}$$

$$= \lim_{x\to\infty} \frac{\frac{2}{x}\to 0 + \frac{1}{x^2}\to 0}{5 - \frac{8}{x} + \frac{3}{x^2}} = \frac{0}{5} = 0$$

(2) $$\lim_{x\to\infty} \frac{3x^1-8}{11x^1+2} = \frac{3}{11}$$

$$\lim_{x\to\infty} \frac{\frac{3x}{x} - \frac{8}{x}}{\frac{11x}{x} + \frac{2}{x}} = \lim_{x\to\infty} \frac{3 + \frac{8}{x}\to 0}{11 + \frac{2}{x}\to 0} = \frac{3}{11}$$

H.A.: $y = 3/11$

(3) $\lim_{x \to \infty} \dfrac{3x^2+8x-1}{2x+5}$ = D.N.E (NO LIMIT)

$$\lim_{x \to \infty} \frac{\frac{3x^2}{x^2} + \frac{8x}{x^2} - \frac{1}{x^2}}{\frac{2x}{x^2} + \frac{5}{x^2}}$$

$$= \lim_{x \to \infty} \frac{(3) + \frac{8}{x}^{0} - \frac{1}{x^2}^{0}}{\frac{2}{x}_{0} + \frac{5}{x^2}_{0}} = \frac{3}{0}$$

Quiz #1: Interview; documented with a **1 -2 page paper**

1.) paper should be typed (word processed), not handwritten
2.) Q & A format is OK; paragraph format is OK
3.) Interview a person (possibly a parent; not a student) who is currently doing for a living what you would eventually like to do for a living (based on your current major – or desired major)
4.) Face-to-face OK; Phone or skype OK; email OK
5.) One question you **MUST** ask: How is math used in this career?
6.) Other suggested questions you will probably want to ask: Average salary? Stress level? Is it seasonal (lots of work at certain times of the year) or fairly steady? Work/Life balance? Lifestyle/perks? Do you find your job rewarding? Is there continuing education associated with this job? Travel associated with this job? Do you have any summer jobs or internships for college students? Did your degree adequately prepare you for this job? And many, many other questions specific to your interviewee....
7.) DUE DATE: Tuesday, March 19, at the beginning of class