MA141 – 004 ①

Tuesday, January 22

$m = 1/5$

$y = \frac{1}{5}x + 3$

$\delta - \epsilon$ proof:

$\lim_{x \to 5} \left(\frac{1}{5}x + 3\right) = 4$

if $|x - x_0| < \delta$

not proof . . . .

$|x - 5| < \delta$

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

$\left|\left(\frac{1}{5}x + 3\right) - 4\right| < \epsilon$

$\left|\frac{1}{5}x - 1\right| < \epsilon$

$\frac{1}{5}|x - 5| < \epsilon$

$|x - 5| < 5\epsilon$ choose $\delta = 5\epsilon$

Proof:

if $|x - 5| < \delta$

(choose $\delta = 5\epsilon$)

$$|x-5| < 5\epsilon$$

$$\frac{1}{5}|x-5| < \epsilon$$

$$\left|\frac{1}{5}x - 1\right| < \epsilon$$

$$\left|\underbrace{\left(\frac{1}{5}x+3\right) - 4}\right| < \epsilon$$

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

contini...

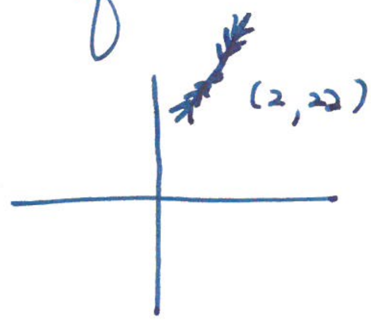
$$\lim_{x \to 2} \left(3x^2 + 7x - 4\right) = 3(4) + 7(2) - 4$$

$$= \underline{\underline{22}}$$

$$\lim_{x \to 2} 3x^2 + \lim_{x \to 2} 7x - \lim_{x \to 2} 4$$

$f(2) = 22$

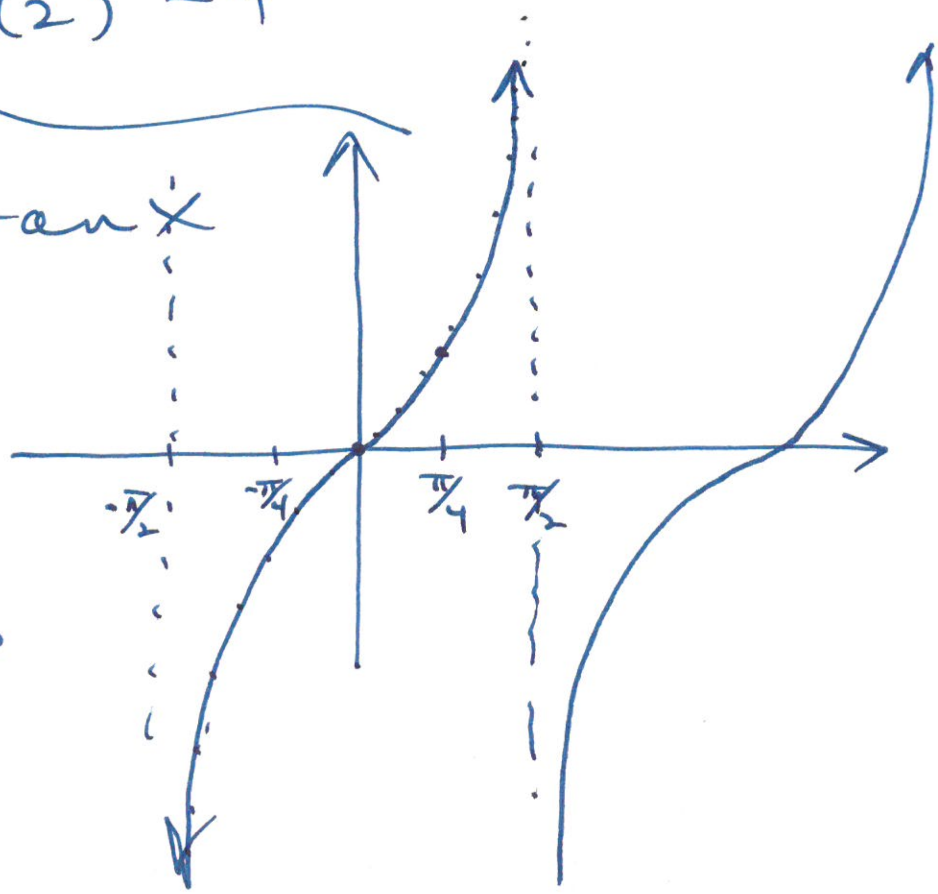
$$3 \lim_{x \to 2} x^2 + 7 \lim_{x \to 2} x - 4$$



$$3 \cdot \left[\lim_{x \to 2} x\right]^2 + 7(2) - 4$$

$$= 3\left[2\right]^2 + 7(2) - 4$$

$f(x) = \tan x$



period: π

ampl: none

$\tan x = 171{,}286$

$f(x) = \tan x$

find $f^{-1}(x)$:

ORIG: $y = \tan x$

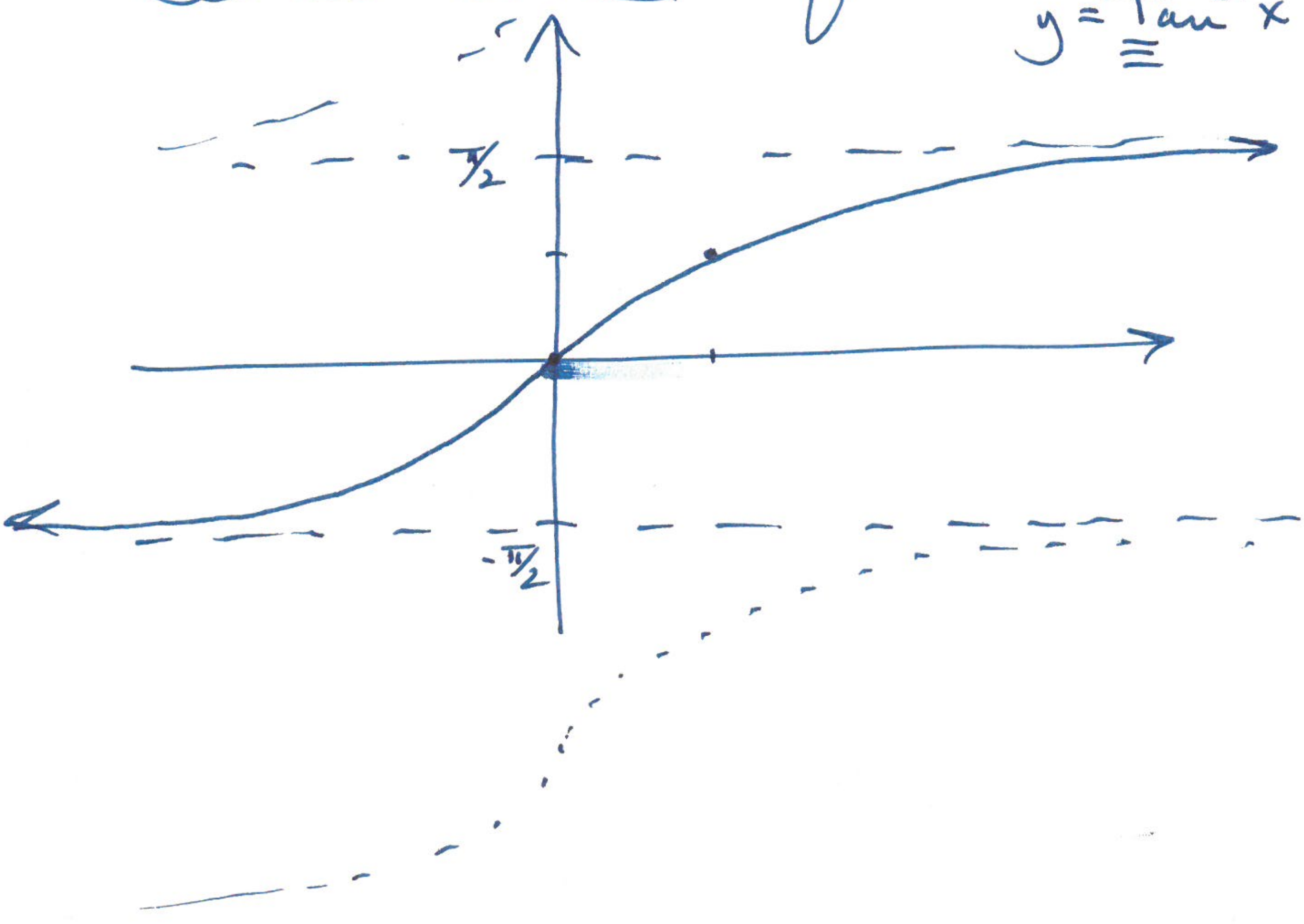
INV: $x = \tan y$

y is the angle whose tangent is x

$(y = \arctan x)$

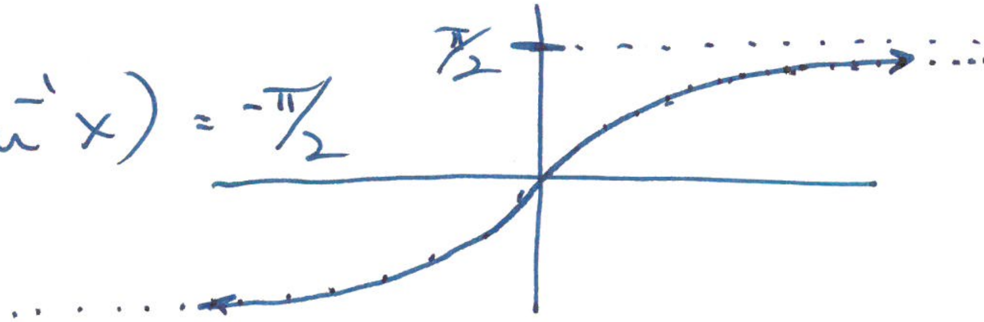
$\underbrace{y = \tan^{-1} x}$ $= f^{-1}(x)$

$y = \text{Tan}^{-1} x$



$$\lim_{x \to \infty} \left(\tan^{-1} x \right) = \pi/2$$

$$\lim_{x \to -\infty} \left(\tan^{-1} x \right) = -\pi/2$$



CONTINUITY

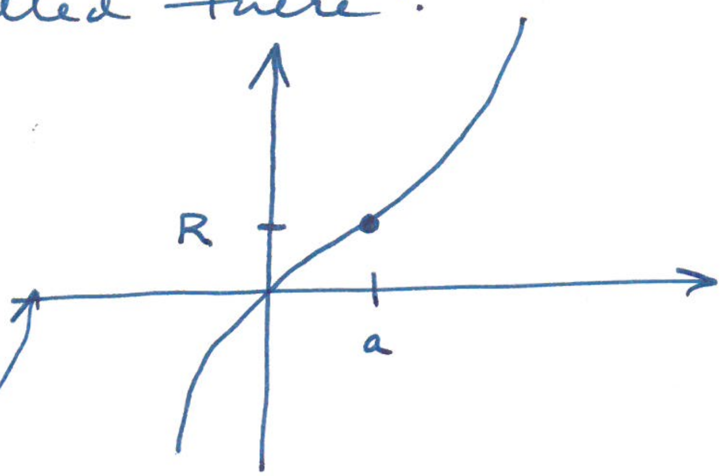
... at $x = a$:

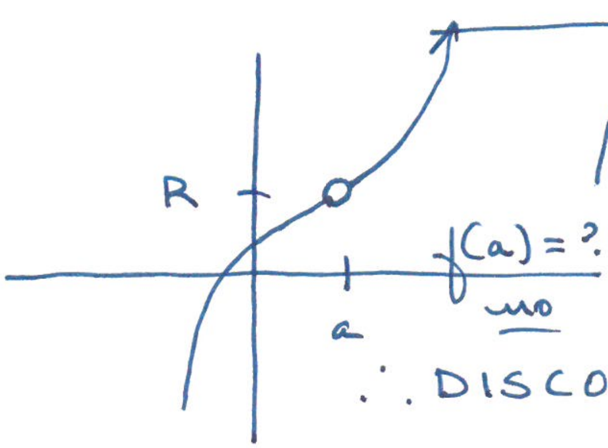
① $f(a)$ exists?

"is there a point plotted there?"

$f(a) = R$

(a, R)



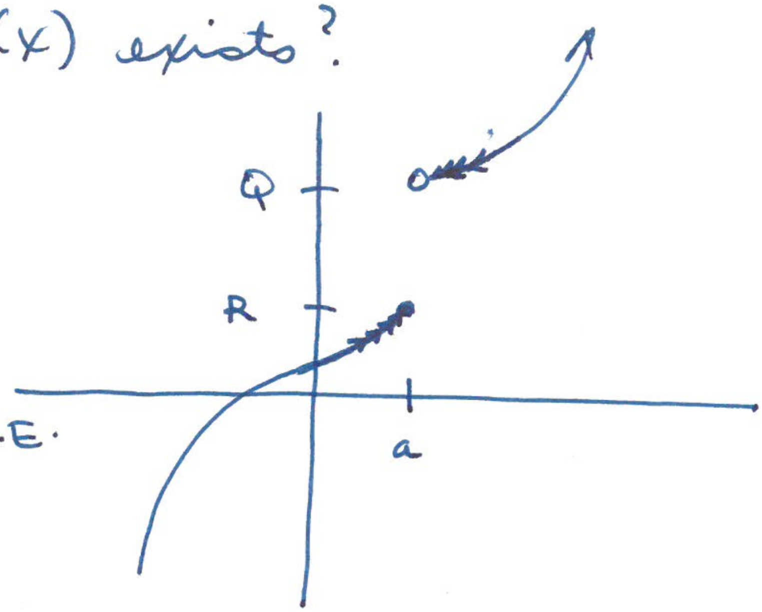


$f(a) = ??$

no

∴ DISCON.

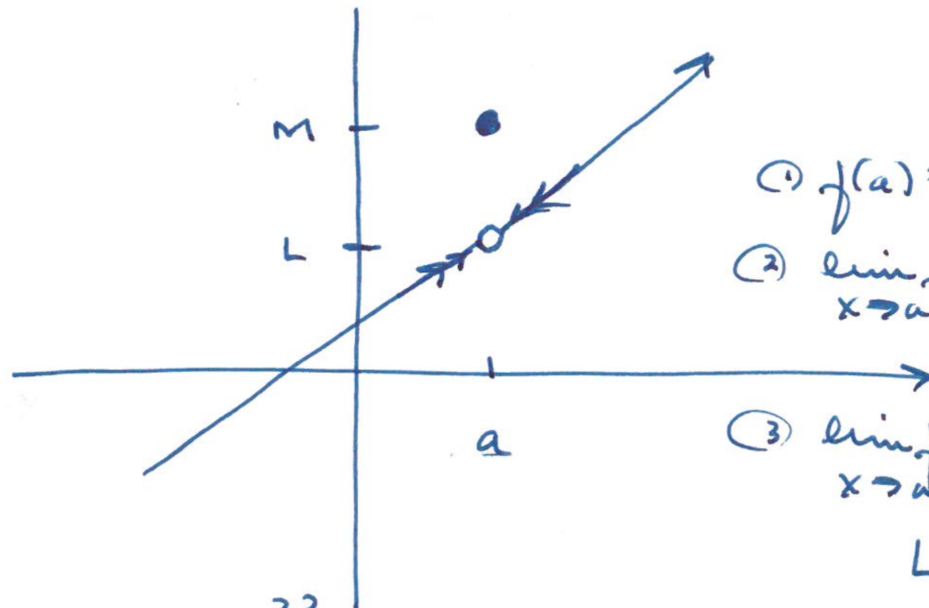
② ¿ $\lim_{x \to a} f(x)$ exists?



① $f(a) = R$ ✓
(a, R)

② $\lim_{x \to a} f(x) = $ D.N.E.

$\therefore$ DISCON.



① $f(a) = \underline{M}$

② $\lim_{x \to a} f(x) = L$

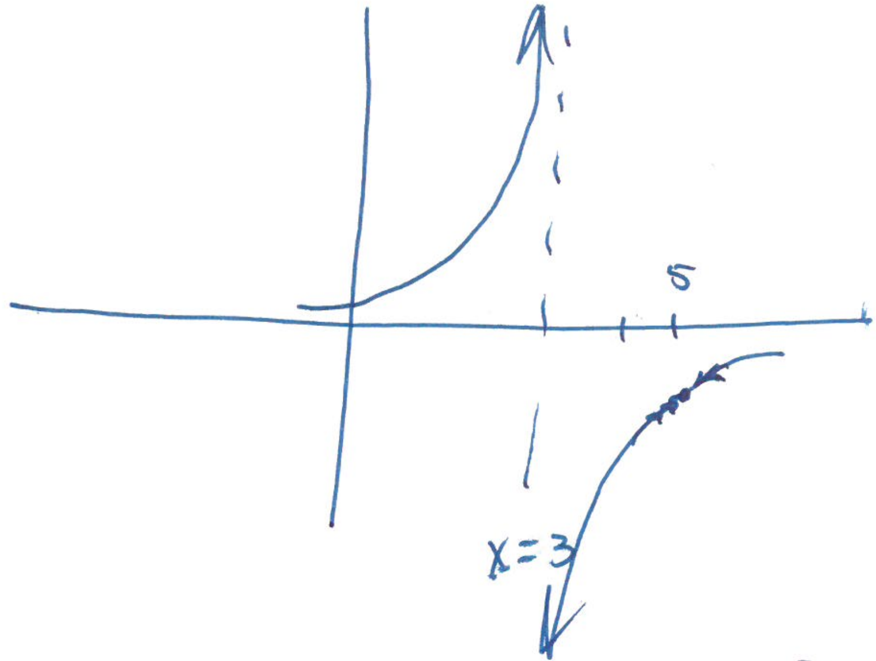
③ $\lim_{x \to a} f(x) \stackrel{?}{=} f(a)$

$\therefore$ $L \neq M$

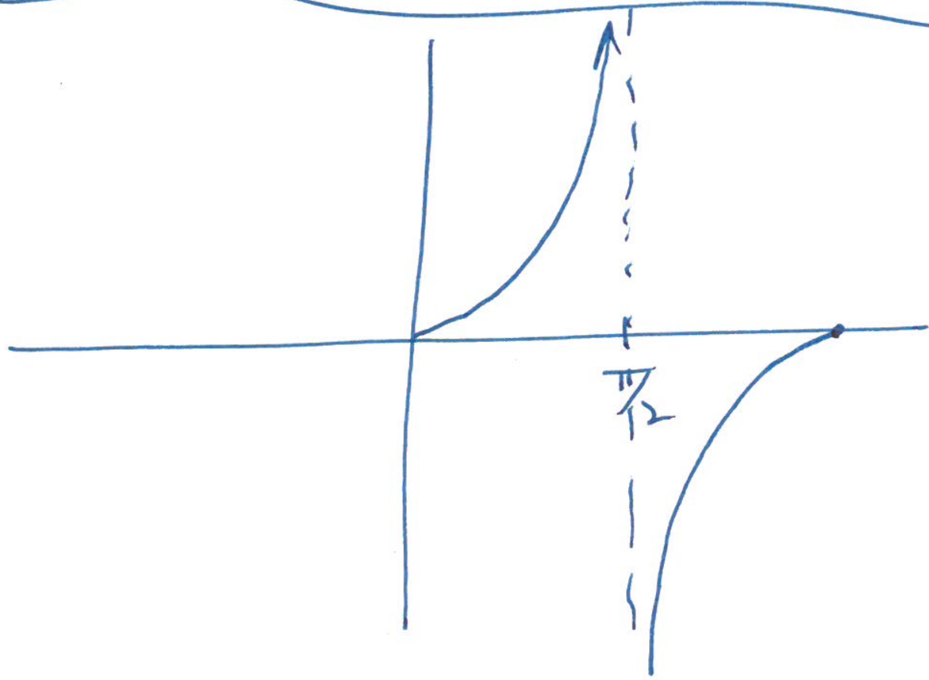
$\therefore$ DISCON.

③ $\lim_{x \to a} f(x) \stackrel{??}{=} f(a)$

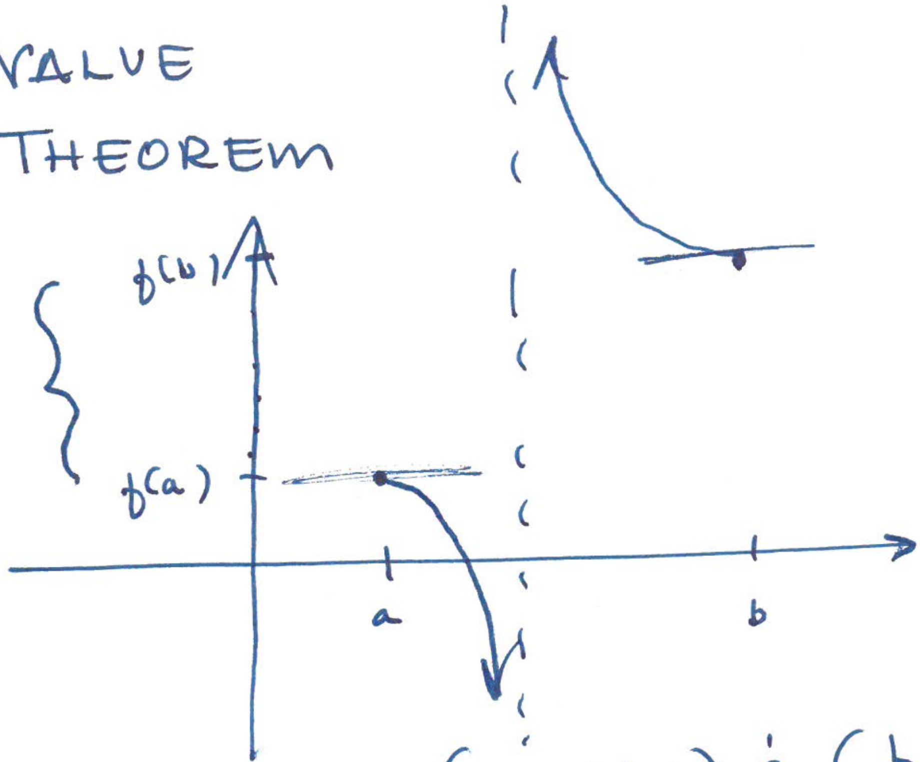
if it "passes" all 3 then contin at that x-val.



¿ contin at $x = 5$? yes



INTERMEDIATE VALUE THEOREM



$y = f(x)$

$(a, f(a))$ & $(b, f(b))$

however . . . .

if $f(x)$ is contin on $[a, b]$

I.V.T.