

# Notes

Pre-Calculus

Sec. 4.6

Graphs of Tangent

with

Vertical & Horizontal

Stretching & Shrinking

set only  
Domain:

$$\{x \mid x \neq \frac{\pi}{2} + \pi n, n \in \mathbb{Z}\}$$

Period: The distance btwn 2 consecutive asymptotes.

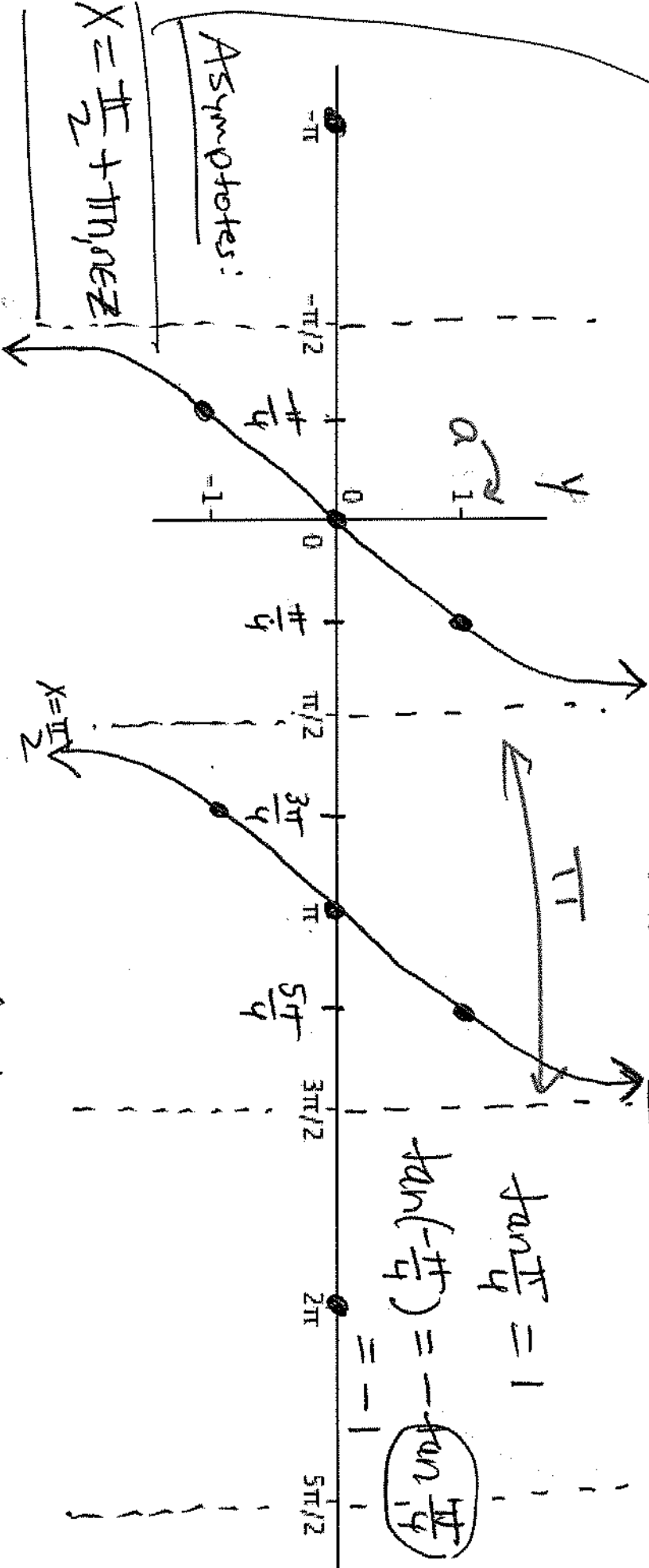
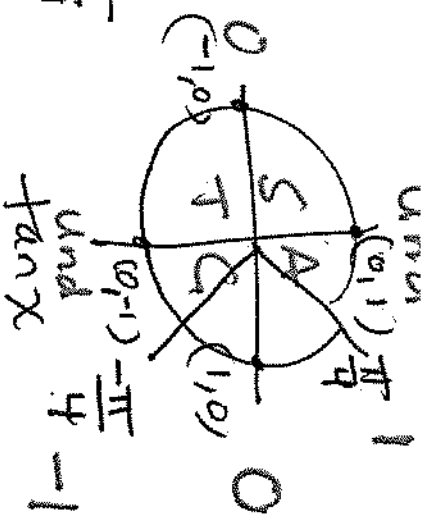
# The Graph of $f(x) = \tan x$

LOF  $A=1$

Amplitude:  $N/A$

Range:  $\{f(x) \mid f(x) \in \mathbb{R}\}$

Increment:  $\frac{1}{4}(\pi) = \frac{\pi}{4}$



Asymptotes:

$$x = \frac{\pi}{2} + \pi n, n \in \mathbb{Z}$$

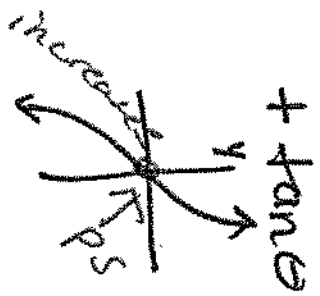
$$\tan \frac{\pi}{4} = 1$$

$$\tan \left(-\frac{\pi}{4}\right) = -\tan \frac{\pi}{4} = -1$$

This graph has Origin symmetry, and is an Odd function.

$$\tan(-x) = -\tan x$$

# Ex. 1: Graph



$a = b = \frac{1}{4}$

$y = 2 \tan \frac{x}{4}$

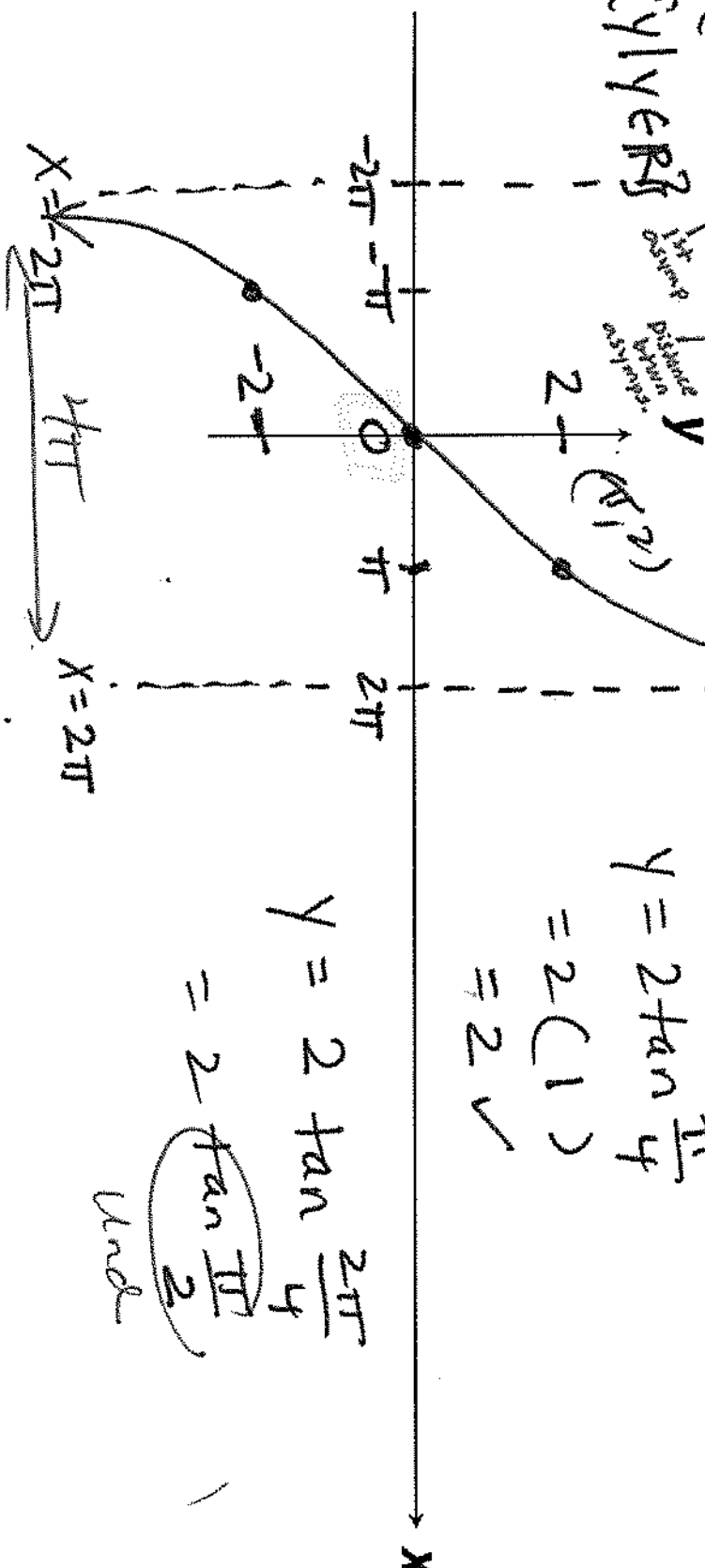
$y = 2 \tan \frac{1}{4}x$

Vert. Stretch  
Horiz. Stretch

Asymptotes:  $X = 2\pi + 4n\pi, n \in \mathbb{Z}$

D:  $\{x | x \neq 2\pi + 4n\pi, n \in \mathbb{Z}\}$

R:  $\{y | y \in \mathbb{R}\}$



Amplitude: Not defined. (N/A)

Period:  $\frac{\pi}{|b|} = \frac{\pi}{\frac{1}{4}} = \pi \cdot 4 = 4\pi$

Phase Shift:  $0$

For  $\tan$  and  $\cot$  wave period  $\pi$

Increment:  $\frac{1}{4}$  (period)

$\frac{1}{4}(4\pi) = \pi$

$(\pi, 2)$

$y = 2 \tan \frac{\pi}{4} = 2(1) = 2 \checkmark$

$y = 2 \tan \frac{2\pi}{4} = 2 \tan \frac{\pi}{2}$   
Und

$y = 2 \tan \frac{3\pi}{4} = 2 \tan \frac{\pi}{4}$

$= 2 \tan \frac{\pi}{4}$

# Ex. 2: Graph

$$y = -3 \tan 4x$$

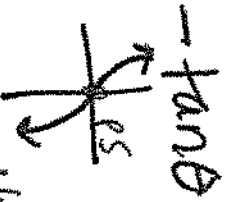
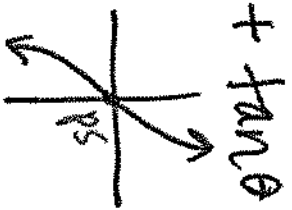
X-axis reflection

vert. stretch

horiz. shrink

Amplitude: Not defined  
Period:  $\frac{\pi}{|b|} = \frac{\pi}{4}$   
Phase Shift:

Horizontal Shrink



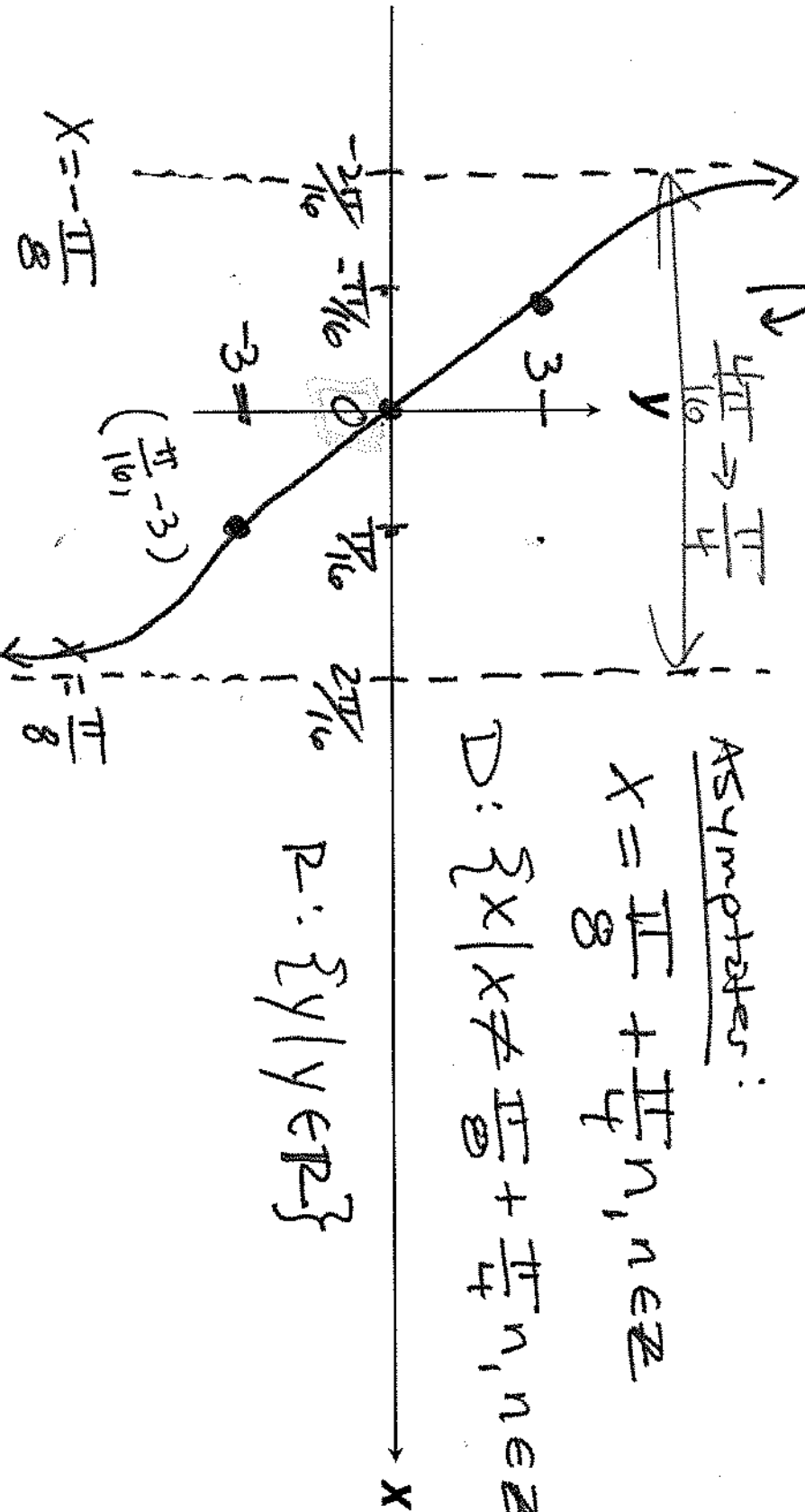
Increment:  $\frac{1}{4} \left( \frac{\pi}{4} \right) = \frac{\pi}{16}$

Asymptotes:

$$x = \frac{\pi}{8} + \frac{\pi}{4}n, n \in \mathbb{Z}$$

$$D: \{x \mid x \neq \frac{\pi}{8} + \frac{\pi}{4}n, n \in \mathbb{Z}\}$$

$$R: \{y \mid y \in \mathbb{R}\}$$



Ex.3: Graph

$$f(x) = -\frac{1}{5} \tan \frac{\pi x}{3}$$

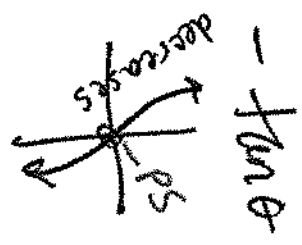
Amplitude: Not defined.

Period:  $\frac{\pi}{|b|} = \frac{\pi}{|\frac{\pi}{3}|} \rightarrow \pi \cdot \frac{3}{\pi} = \boxed{3}$

Phase Shift:

$\frac{\pi}{|b|} = \frac{\pi}{|\frac{\pi}{3}|} = \boxed{0}$

Increment:  $\frac{1}{4}(3) = \boxed{\frac{3}{4}}$



$f(x) = -\frac{1}{5} \tan \frac{\pi x}{3}$   
 X-axis reflection  
 Vert. Shrink  
 Horiz. Shrink

$\frac{\pi}{2} \Rightarrow 3$

Asymptotes:  
 $x = \frac{3}{2} + 3n, n \in \mathbb{Z}$

D:  $\{x | x \neq \frac{3}{2} + 3n, n \in \mathbb{Z}\}$

R:  $\{f(x) | f(x) \in \mathbb{R}\}$

