

5.3 Tangent Function

Friday, October 28, 2022 10:42 AM

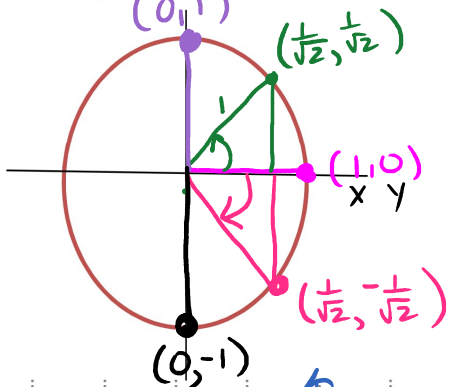
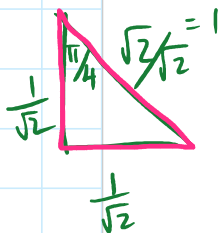
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5.3 The Tangent Function

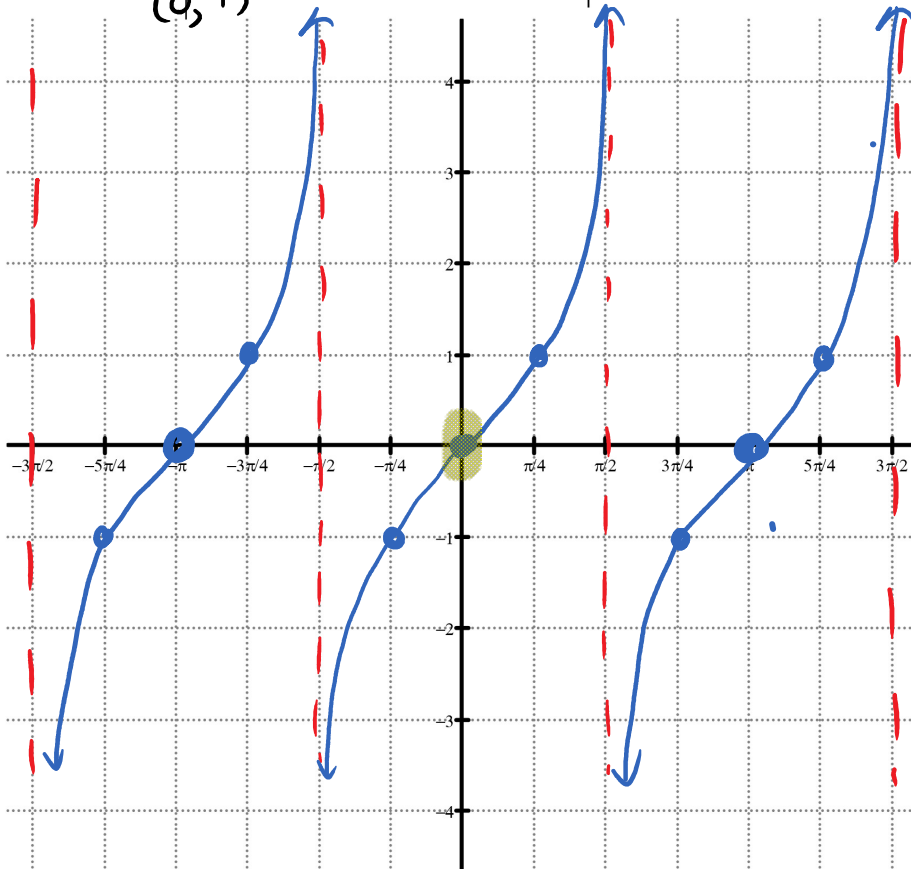
Tangent Function
Graphing the tan function

$$f(\theta) = \tan \theta$$

$$\tan \theta = \frac{y}{x}$$



θ	$f(\theta)$
0	$\frac{0}{1} = 0$
$\frac{\pi}{4}$	$\frac{1/\sqrt{2}}{1/\sqrt{2}} = 1$
$\frac{\pi}{2}$	$\frac{1}{0} = \text{undefined}$ Asymptote
$-\frac{\pi}{4}$	$-\frac{1/\sqrt{2}}{1/\sqrt{2}} = -1$
$-\frac{\pi}{2}$	$-\frac{1}{0} = \text{Asymptote}$



$-\frac{\pi}{2}$	ASY
$-\frac{\pi}{4}$	-1
0	0
$\frac{\pi}{4}$	1
$\frac{\pi}{2}$	ASY

$$\tan \theta = \frac{y}{x}$$

$$\sin \theta = \frac{y}{r}$$

$$\cos \theta = \frac{x}{r}$$

$$\therefore \frac{\sin \theta}{\cos \theta} = \frac{y/r}{x/r} \Rightarrow \frac{\sin \theta}{\cos \theta} = \frac{y}{x} = \tan \theta$$

- What is the period of $y = \tan x$?

period = π

$y = \tan bx$
period = $\frac{\pi}{b}$

- What is the value of any asymptotes of $y = \tan x$?

$x = \frac{\pi}{2}$ $x = -\frac{\pi}{2}$ $x = \frac{3\pi}{2}$ $x = -\frac{3\pi}{2}$ $x = \frac{5\pi}{2}$ $x = -\frac{5\pi}{2}$
* * * * *

- What is the general equation for the asymptotes?

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

$x = (\text{odd \#s}) \frac{\pi}{2}$
 $x = (2n+1) \frac{\pi}{2}$ $n \in \mathbb{I}$ *

- What is the amplitude of $\tan x$?

No Max }
No Min } No amplitude

None
N/A
X

No idea

- What is the domain?

x-value
 $x \neq \text{asymptotes}$

$\{x \mid x \neq \frac{\pi}{2} + \pi n \quad n \in \mathbb{I} \quad x \in \mathbb{R}\}$
asymptote

- What is the range?

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

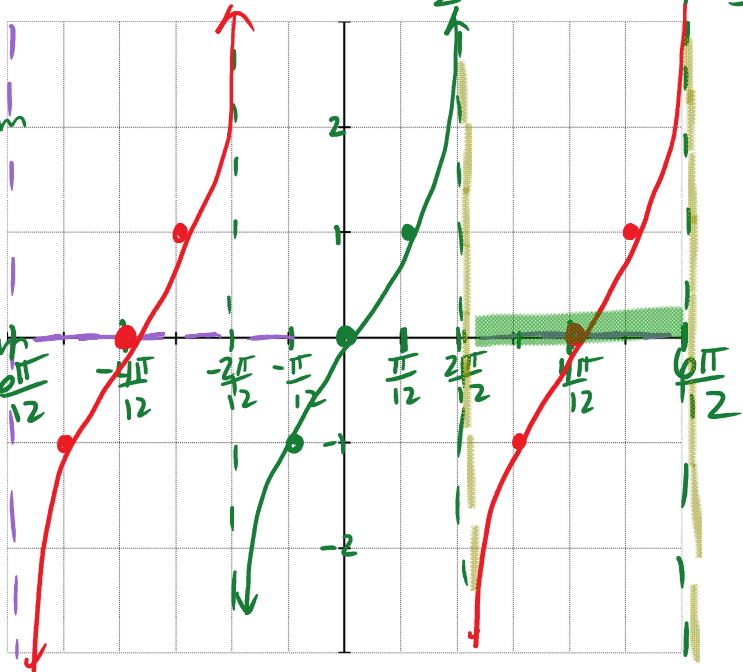
Period = $\frac{\pi}{3}$
 1st Asym = $\frac{2\pi}{12} = \frac{\pi}{6}$
 $b = 3$

Example #1 Graph $y = \tan 3\theta$

old

$-\pi/2$	asym
$-\pi/4$	-1
0	0
$\pi/4$	1
$\pi/2$	Asym

$b = 3$
 Divide x 's by 3
 $\frac{2\pi}{12} = \frac{\pi}{6}$ Asym
 $-\frac{\pi}{12}$ -1
 0 0
 $\frac{\pi}{12}$ 1
 $\frac{2\pi}{12} = \frac{\pi}{6}$ Asym



Example #2 Given $y = 3 \tan \frac{1}{2}\theta$ find the following:

a) Period
 period = $\frac{\pi}{b}$ $b = \frac{1}{2}$ period = $\frac{\pi}{1/2}$
 $= \pi \cdot \frac{2}{1}$
 $= 2\pi$

b) Amplitude
 None $a = 3$
 Mult y 's by 3

c) First asymptote to the right of the origin
 (0,0)
 1st Asymptote = $\frac{1}{2}$ period
 $= \frac{1}{2} \cdot 2\pi$
 1st Asym = π

d) Second asymptote to the right of the origin
 2nd asym = 1st asym + period
 $= \pi + 2\pi$
 $= 3\pi$

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Practice

1. Graph each function and state the following:
 - The period
 - General equation of asymptotes
 - Domain
 - Range

a) $y = \tan 2\theta \quad -\pi < \theta < \pi$

b) $y = \tan 4\theta$ at least 3 periods

c) $y = 3 \tan \theta \quad -\pi < \theta < \pi$

d) $y = \tan\left(\theta - \frac{\pi}{2}\right) \quad -\pi < \theta < \pi$