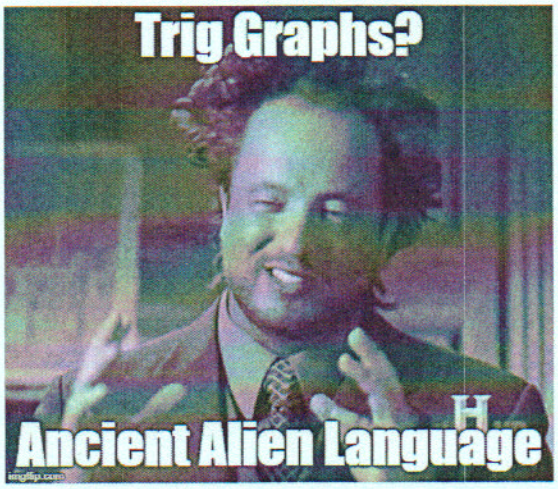
Precalculus

Lesson 6.5 Part 2: Graphs of the Tangent and Cotangent Functions

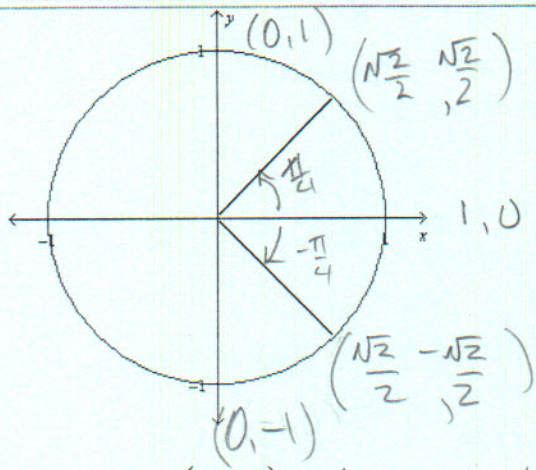
Mrs. Snow, Instructor



Tangent function facts:

- $y = \tan \omega x \qquad period = \frac{\pi}{\omega}$
- $\tan x = \frac{\sin x}{\cos x}, \ \therefore \ when \ \sin x = 0, \quad \tan x = 0$

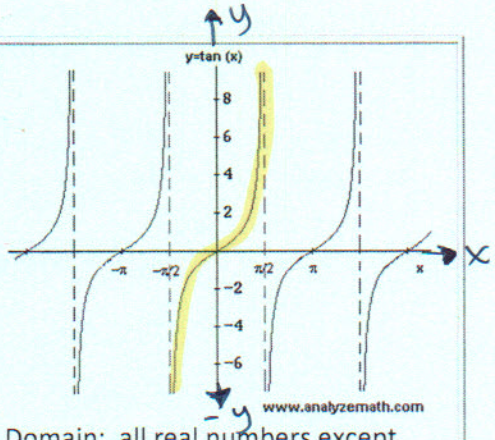
  $when \cos x = 0, \quad \tan x \ is \ undefined!$
- Tangent graph will have asymptotes at values of x where the function is undefined: $x = \frac{\pi}{2} and -\frac{\pi}{2}.$



Period: π $\left(-\frac{\pi}{2}, \frac{\pi}{2}\right)$ Asymptote to Asymptote

input x (θ)	$-\frac{\pi}{2}$	$-\frac{\pi}{4}$	0	$\frac{\pi}{4}$	$\frac{\pi}{2}$
$y = tanx$	U	-1	0	1	U

Asymptotes



Domain: all real numbers except odd mult. of $\frac{\pi}{2}$

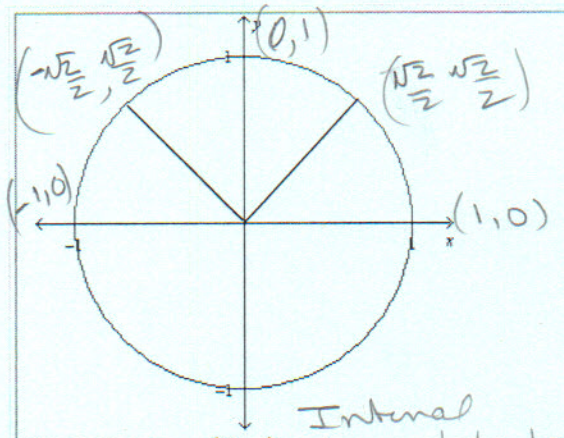
Range: $(-\infty, \infty)$

Symmetry is an odd function

$\tan -\theta = -\tan \theta$

Cotangent function facts:

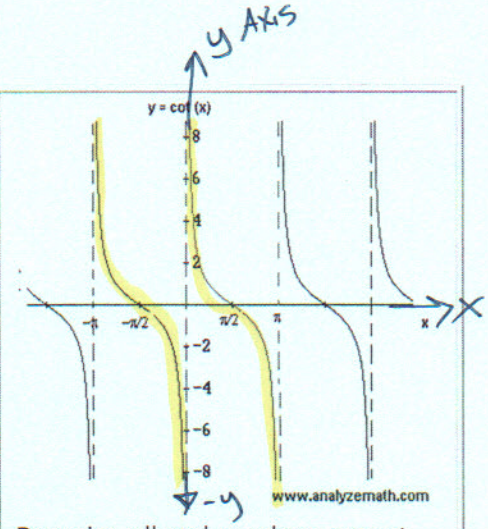
- $y = \cot \omega x \qquad period = \frac{\pi}{\omega}$
- $\cot x = \frac{\cos x}{\sin x} \quad \therefore when \cos x = 0, \quad \cot x = 0$
- $when \sin x = 0, \quad \cot x \; is \; undefined$
- Asymptotes are found at π and multiples of π.



Period: π $(0, \pi)$ Internal Asymptote to Asymptote

input x θ	0	$\frac{\pi}{4}$	$\frac{\pi}{2}$	$\frac{3\pi}{4}$	π
$y = cot\theta$	U	1	0	-1	U

Asymptotes



Domain: all real numbers except mult. of π

Range: $(-\infty, \infty)$

$\cot -\theta = -\cot \theta$

Symmetry => odd

$y = 3\tan(2x)$

$\omega = 2$ $\quad \frac{\pi}{\omega} = period = \frac{\pi}{2}$ $\quad A = 3$

Interval:

$\left(\frac{-\pi}{2\omega}, \frac{\pi}{2\omega}\right)$

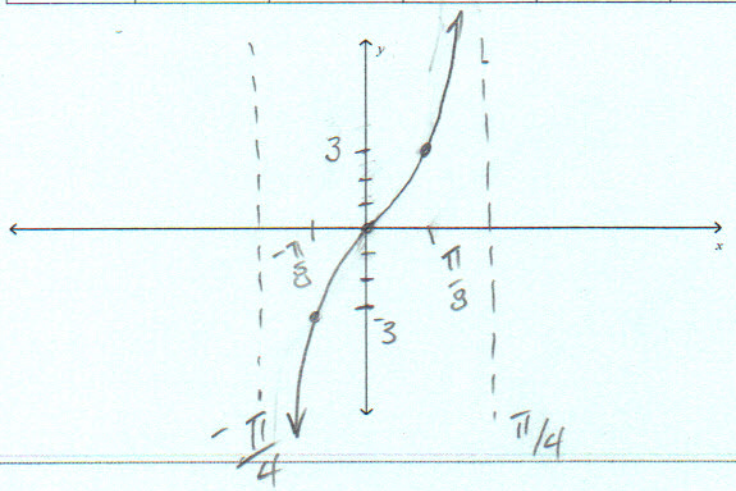
$\left(\frac{-\pi}{2(2)}, \frac{\pi}{2(2)}\right)$

$\left(-\frac{\pi}{4}, \frac{\pi}{4}\right)$

x	$-\frac{\pi}{4}$	$-\frac{\pi}{8}$	0	$\frac{\pi}{8}$	$\frac{\pi}{4}$
$2x$	$-\frac{\pi}{2}$	$-\frac{\pi}{4}$	0	$\frac{\pi}{4}$	$\frac{\pi}{2}$
$\tan 2x$	U	-1	0	U	1
$3\tan 2x$	U	-3	0	U	3

Avg:

$0 + \frac{\pi}{4} = \frac{\pi}{4}\left(\frac{1}{2}\right) = \frac{\pi}{8}$



$y = A\cot(\omega x) + B$ $\quad period = \frac{\pi}{\omega}$ $\quad$ For cotangent and appropriate interval is: $\left(0, \frac{\pi}{\omega}\right)$.

$A = 1$ $\quad \omega = 1$ $\quad B = 2\uparrow$ $\quad y = \cot x + 2$

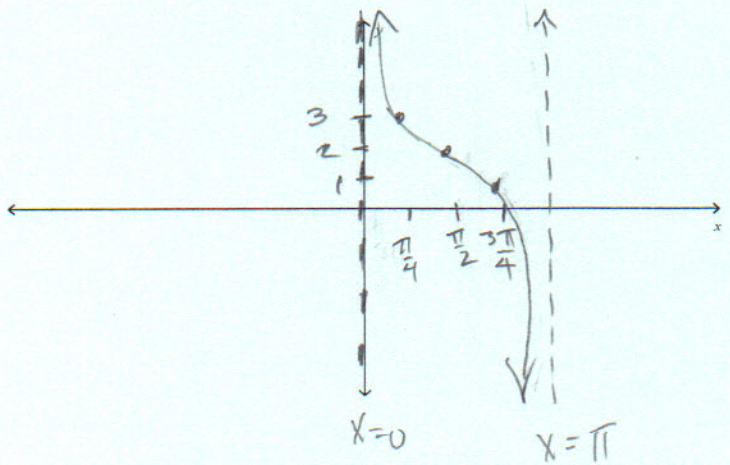
Interval:

$(0\ \pi)$

$(0, \pi)$

x	0	$\frac{\pi}{4}$	$\frac{\pi}{2}$	$\frac{3\pi}{4}$	π
$\cot x$	U	1	0	-1	U
$\cot x + 2$	U	3 (+2)	2	1 (+2)	U

Avg

$\frac{\pi}{2} + \frac{2\pi}{2} = \frac{3\pi}{2}\left(\frac{1}{2}\right)$

$= \frac{3\pi}{4}$