

Name: \_\_\_\_\_

Date: \_\_\_\_\_

<p><b>Learning Goal 5.1</b></p>	<p>Graphing primary trigonometric functions, including transformations and characteristics</p>
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Unit Circle Definition of Tangent Function

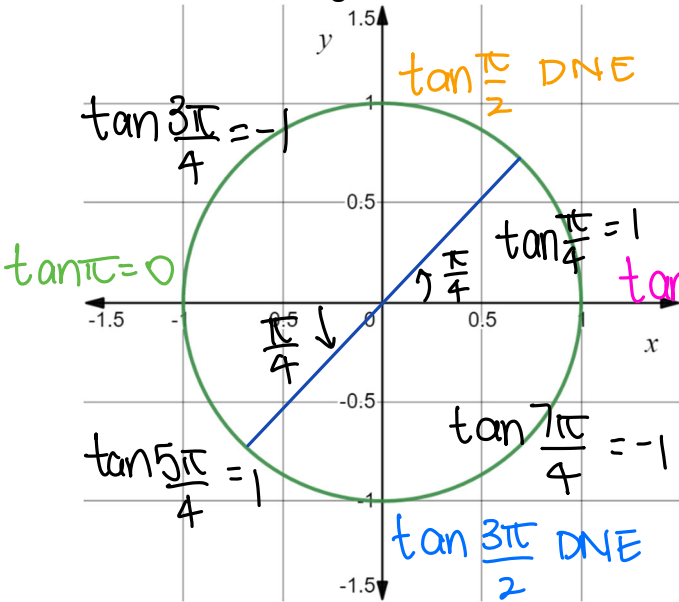
$r = 1$

$x^2 + y^2 = 1$

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

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

Unit Circle with Tangent Line



Derivation of the identity

$\tan \theta = \frac{\sin \theta}{\cos \theta}$

$= \frac{\left(\frac{y}{r}\right)}{\left(\frac{x}{r}\right)}$

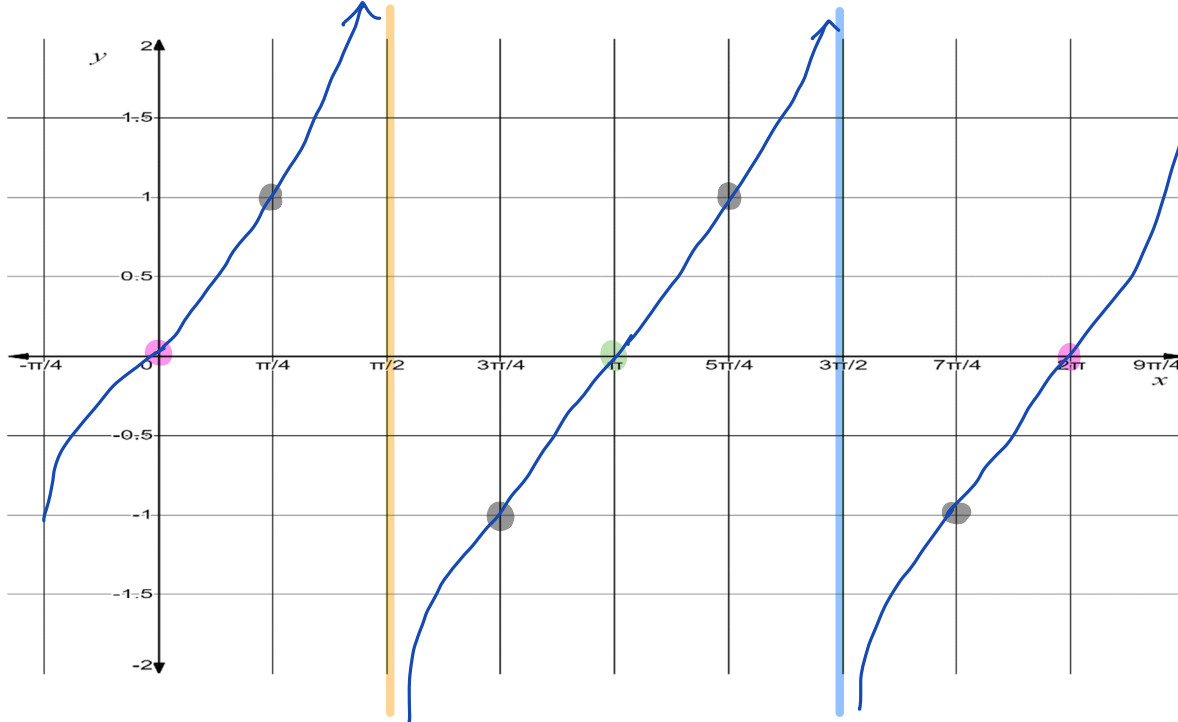
$= \left(\frac{y}{r}\right) \times \left(\frac{r}{x}\right)$

$= \frac{y}{x}$

$\sin \theta$  and  $\cos \theta$  graphs are shown below.

Sketch of the graph  $y = \tan \theta$

[http://commons.wikimedia.org/wiki/File:Tan\\_drawing\\_process.gif](http://commons.wikimedia.org/wiki/File:Tan_drawing_process.gif)



$y = \frac{1}{x}$

period start: 0  
 period end:  $\pi$   
 Period:  $\pi$

Function	Domain	Range	Period	x - Intercepts	Asymptotes
$y = \sin x$	$x \in \mathbb{R}$	$-1 \leq y \leq 1$	$2\pi$	$0, \pi, 2\pi, \dots$	none
$y = \cos x$	$x \in \mathbb{R}$	$-1 \leq y \leq 1$	$2\pi$	$\frac{\pi}{2}, \frac{3\pi}{2}, \frac{5\pi}{2}, \dots$	none
$y = \tan x$ <small><math>= \frac{\sin x}{\cos x}</math></small>	$x \neq \frac{\pi}{2}, \frac{3\pi}{2}, \frac{5\pi}{2}, \dots$	$y \in \mathbb{R}$	$\pi$	$0, \pi, 2\pi, \dots$	$\frac{\pi}{2}, \frac{3\pi}{2}, \frac{5\pi}{2}, \dots$

**Example** Graph the function  $y = 3 \tan 2x$  for  $0 \leq x \leq 2\pi$ .

- a. What is the period of the function?

base period  $\rightarrow \pi \times \frac{1}{2}$   
HS.

- b. State the domain and range of the function.

DOMAIN  
 $\{x \mid x \neq (2n-1)\frac{\pi}{4}, n \in \mathbb{Z}, x \in \mathbb{R}\}$   
or

$\{x \mid x \neq \frac{\pi}{4}, \frac{3\pi}{4}, \frac{5\pi}{4}, \frac{7\pi}{4}, x \in \mathbb{R}\}$

**Example** Graph the function  $f(x) = -3 \tan \frac{1}{2}x$ . State the domain and range of the function and the equation of any asymptotes.

base period  $\rightarrow \pi \times 2 = 2\pi$   
HS.

