

4.4 - Day 2 - Tangent Functions

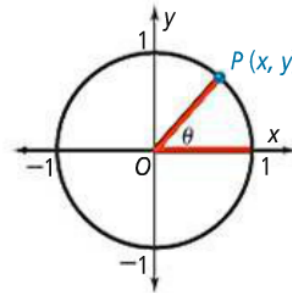
The graph of $y = \tan x$ represents the ratio of the y/x of the points around the unit circle, or you can think of it as the slope of the radius as it rotates around the circle.

Take note

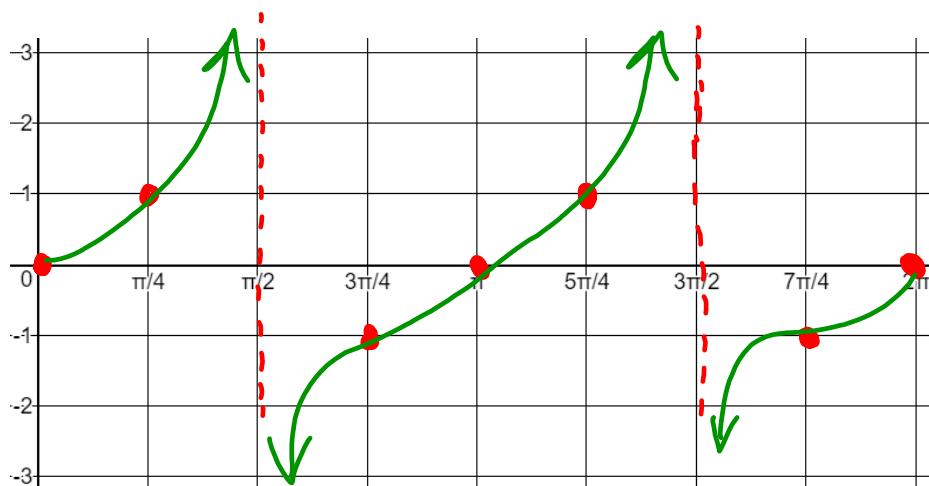
Key Concept Tangent of an Angle

Suppose the terminal side of an angle θ in standard position intersects the unit circle at the point (x, y) . Then the ratio $\frac{y}{x}$ is the **tangent of θ** , denoted $\tan \theta$.

In this diagram, $x = \cos \theta$, $y = \sin \theta$, and $\frac{y}{x} = \tan \theta$.



θ (x-axis)	0	$\frac{\pi}{4}$	$\frac{\pi}{2}$	$\frac{3\pi}{4}$	π	$\frac{5\pi}{4}$	$\frac{3\pi}{2}$	$\frac{7\pi}{4}$	2π
Point on the Unit circle:	(1,0)	$(\frac{\sqrt{2}}{2}, \frac{\sqrt{2}}{2})$	(0,1)	$(-\frac{\sqrt{2}}{2}, \frac{\sqrt{2}}{2})$	(-1,0)	$(-\frac{\sqrt{2}}{2}, -\frac{\sqrt{2}}{2})$	(0,-1)	$(\frac{\sqrt{2}}{2}, -\frac{\sqrt{2}}{2})$	(1,0)
Ratio of $\frac{y}{x}$ (y-axis)	$\frac{0}{1}$ 0	1	$\frac{1}{0}$ undef.	-1	$\frac{0}{-1}$ 0	1	$\frac{-1}{0}$ undef.	-1	$\frac{0}{1}$ 0

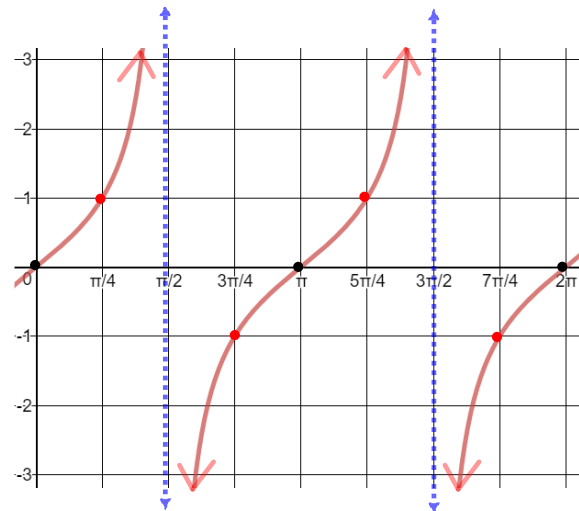


Graphing Tangent's Parent Function

- Period = $\frac{\pi}{b}$
- $y = a \tan bx$
- Since the period of the parent function is just π , you will need two cycles (8 critical points) to graph from 0 to 2π .
 - The a -value stretches the points before/after the "zero" points.
 - If the a -value is negative, then the graph is reflected over the x -axis.

*NOTE: First five critical locations of $y = \tan x$ follows this pattern:

zero, + 'a', asymptote, - 'a', zero



Ex.1 Find all the unknowns. Then graph TWO cycles.

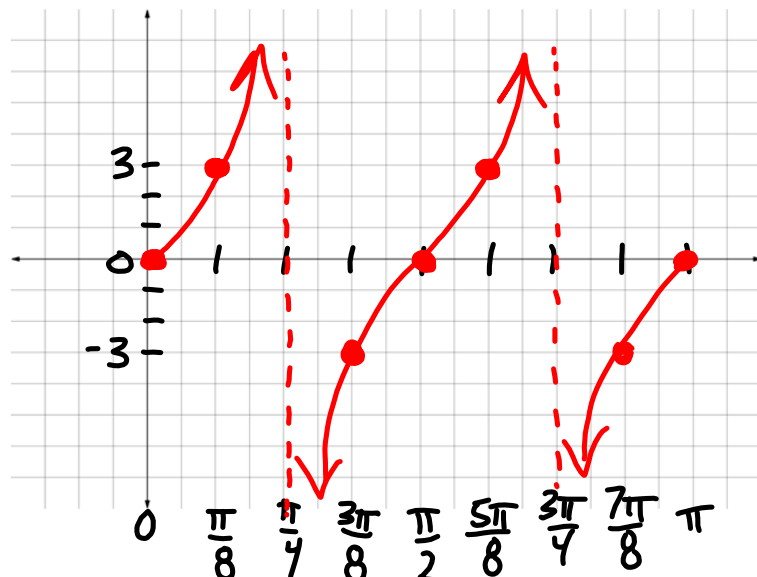
$$y = 3 \tan 2\theta$$

a - value = 3

Reflection? Yes / No (circle one)

Period = $\frac{\pi}{2}$ = $\frac{\pi}{2}$

Midline: $y=0$



Ex.2 Find all the unknowns. Then graph TWO cycles.

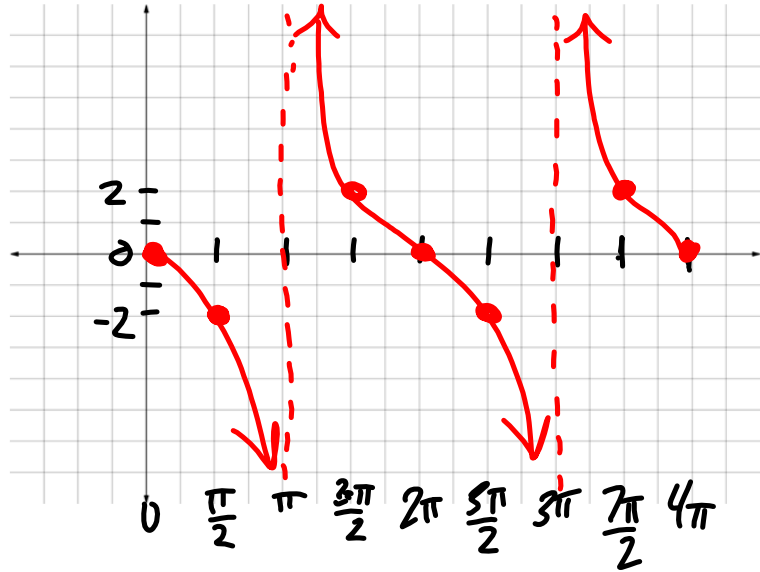
$$y = -2 \tan \frac{\theta}{2}$$

a - value = 2

Reflection? Yes / No (circle one)

Period = 2π $= \frac{\pi}{\frac{1}{2}}$

Midline: $y=0$



Ex.3 Find all the unknowns. Then graph TWO cycles.

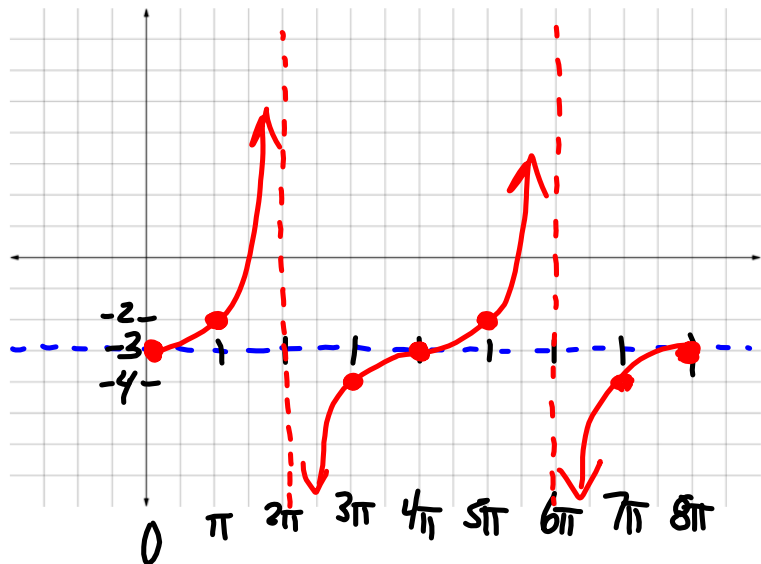
$$y = \tan \frac{\theta}{4} - 3$$

a - value = 1

Reflection? Yes / No (circle one)

Period = 4π $= \frac{\pi}{\frac{1}{4}}$

Midline: $y=-3$



Ex.4 Find all the unknowns. Then graph TWO cycles.

$$y = 3 \tan\left(\theta + \frac{\pi}{4}\right)$$

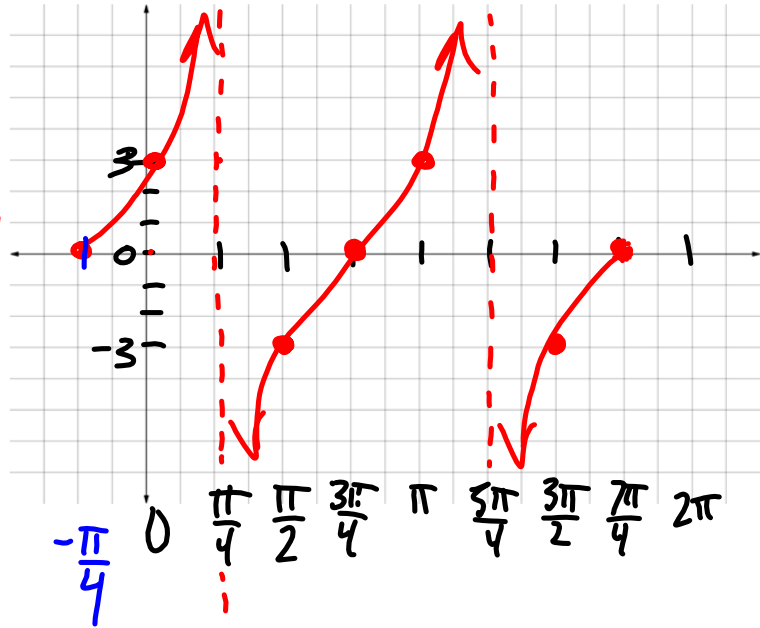
Left 2 units!

a - value = 3

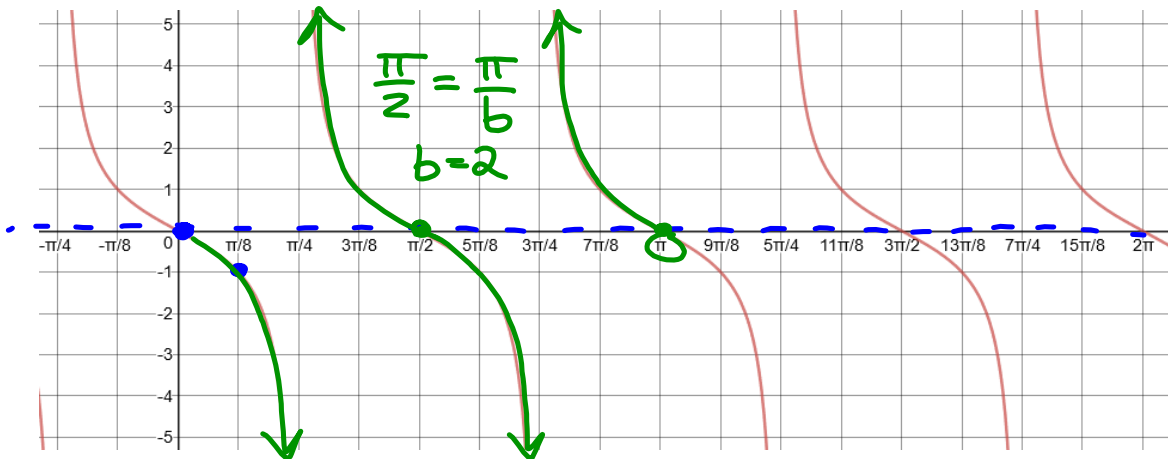
Reflection? Yes / No (circle one)

Period = π = $\frac{\pi}{1}$

Midline: $y=0$



Ex.5 Find all the unknowns. Then write the function.



a - value: 1 b - value: 2 midline: $y=0$

Reflection? Yes / No

Function: $y = -\tan 2\theta$