

**Topic/Aim:** Graphs of other trig functions.

What is domain, range, and period of each?

Monday, April 29<sup>th</sup> 2020

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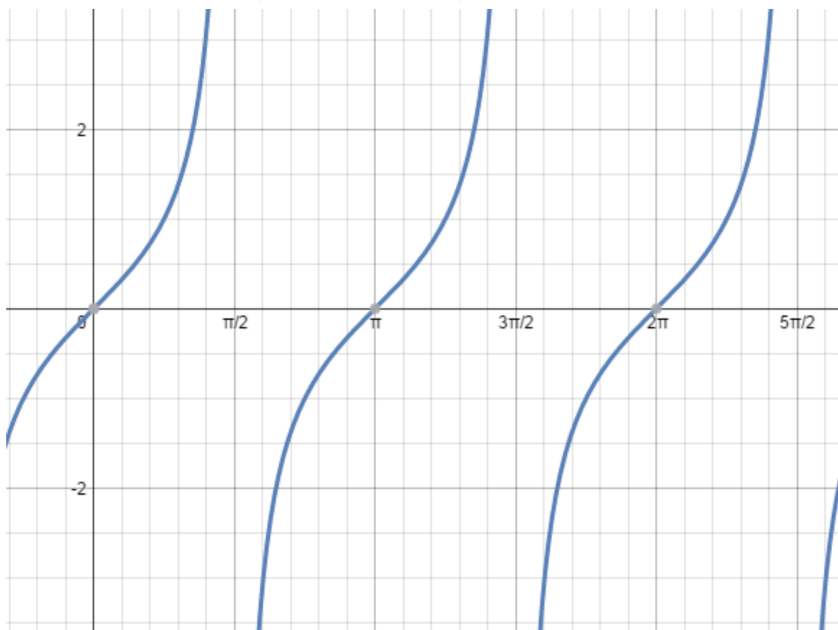
**Task (below):** As you read and complete the task linked, please be sure to take notes. If you have any questions, please join Tomas at 1:00 PM or Katherine at 2:30 PM for office hours on google hangouts.

### GRAPHING TANGENT FUNCTIONS

The graph of  $y = \tan x$  has the following characteristics.

1. The **domain** is all real numbers except odd multiples of  $\pi/2$ . At odd multiples of  $\pi/2$ , the graph has vertical asymptotes.
2. The **range** is all real numbers,  $(-\infty, \infty)$ .
3. The graph has a **period** of  $\pi$ .

Graph of the tangent function ( $y = \tan x$ )



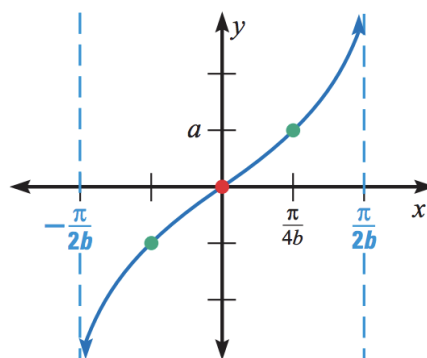
## CHARACTERISTICS OF $Y = A \tan BX$

If  $a$  and  $b$  are nonzero real numbers, the graph of  $y = a \tan bx$  has these characteristics:

- The period is  $\frac{\pi}{|b|}$ .
- There are vertical asymptotes at odd multiples of  $\frac{\pi}{2|b|}$ .

**Example** The graph of  $y = 5 \tan 3x$  has period  $\frac{\pi}{3}$  and asymptotes at  $x = (2n + 1)\frac{\pi}{6} = \frac{\pi}{6} + \frac{n\pi}{3}$  where  $n$  is any integer.

The graph at the right shows five key  $x$ -values that can help you sketch the graph of  $y = a \tan bx$  for  $a > 0$  and  $b > 0$ . These are the  $x$ -intercept, the  $x$ -values where the asymptotes occur, and the  $x$ -values halfway between the  $x$ -intercept and the asymptotes. At each halfway point, the function's value is either  $a$  or  $-a$ .



Example 1:

$$\text{Graph } y = \frac{3}{2} \tan 4x$$

### SOLUTION

The period is  $\frac{\pi}{b} = \frac{\pi}{4}$ .

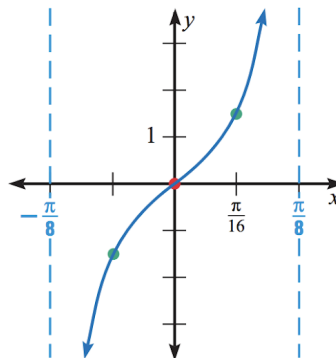
**Intercept:**  $(0, 0)$

**Asymptotes:**  $x = \frac{1}{2} \cdot \frac{\pi}{4}$ , or  $x = \frac{\pi}{8}$ ;

$$x = -\frac{1}{2} \cdot \frac{\pi}{4}, \text{ or } x = -\frac{\pi}{8}$$

**Halfway points:**  $\left(\frac{1}{4} \cdot \frac{\pi}{4}, \frac{3}{2}\right) = \left(\frac{\pi}{16}, \frac{3}{2}\right)$ ;

$$\left(-\frac{1}{4} \cdot \frac{\pi}{4}, -\frac{3}{2}\right) = \left(-\frac{\pi}{16}, -\frac{3}{2}\right)$$



PRACTICE:

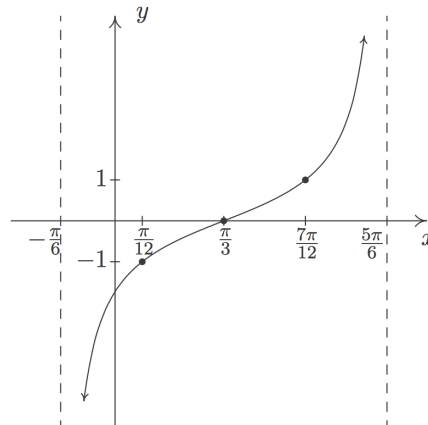
1. For each trig function and graph given, identify the key features listed below:

a.  $y = \tan\left(x\frac{\pi}{3}\right)$

Period: \_\_\_\_\_

Range: \_\_\_\_\_

Domain: \_\_\_\_\_

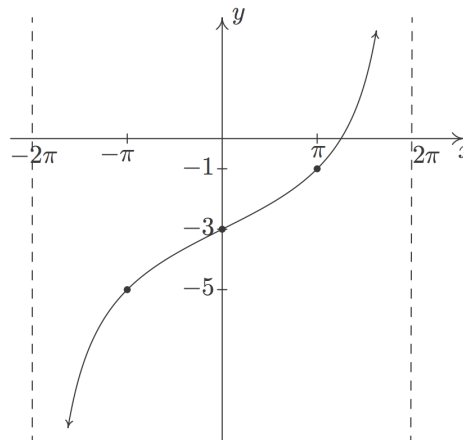


b.  $y = 2\tan\left(\frac{1}{4}x\right) - 3$

Period: \_\_\_\_\_

Range: \_\_\_\_\_

Domain: \_\_\_\_\_

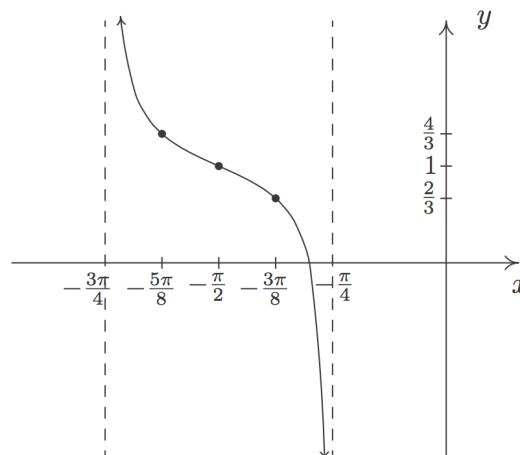


c.  $y = \frac{1}{3}\tan(-2x - \pi) + 1$

Period: \_\_\_\_\_

Range: \_\_\_\_\_

Domain: \_\_\_\_\_



2. Graph the following functions. Identify the domain, range and period.

a.  $y = \tan ( 3x)$

b.  $y = 2 \tan ( 4x)$

Video Reference(s):

1. [How To Graph Tangent and Cotangent Functions](#)
2. [Domain and Range of Trigonometric Functions](#)