

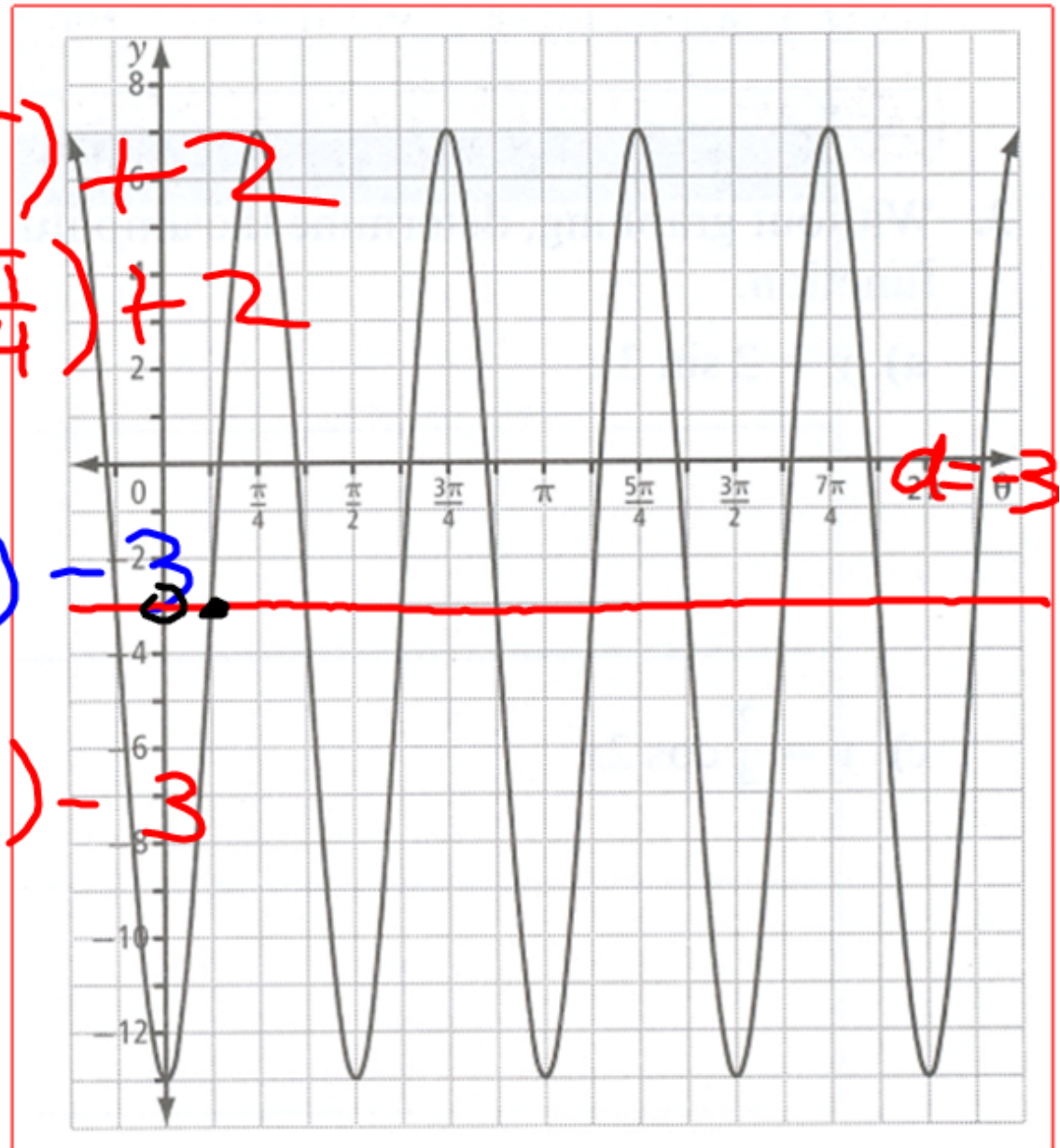
Find both the cosine and sine equation for the following graph. Assume $a > 0$ and a positive phase shift

$$y = 3 \sin(4x - \pi) + 2$$

$$= 3 \sin 4\left(x - \frac{\pi}{4}\right) + 2$$

$$y = 10 \sin 4\left(x - \frac{\pi}{8}\right) - 3$$

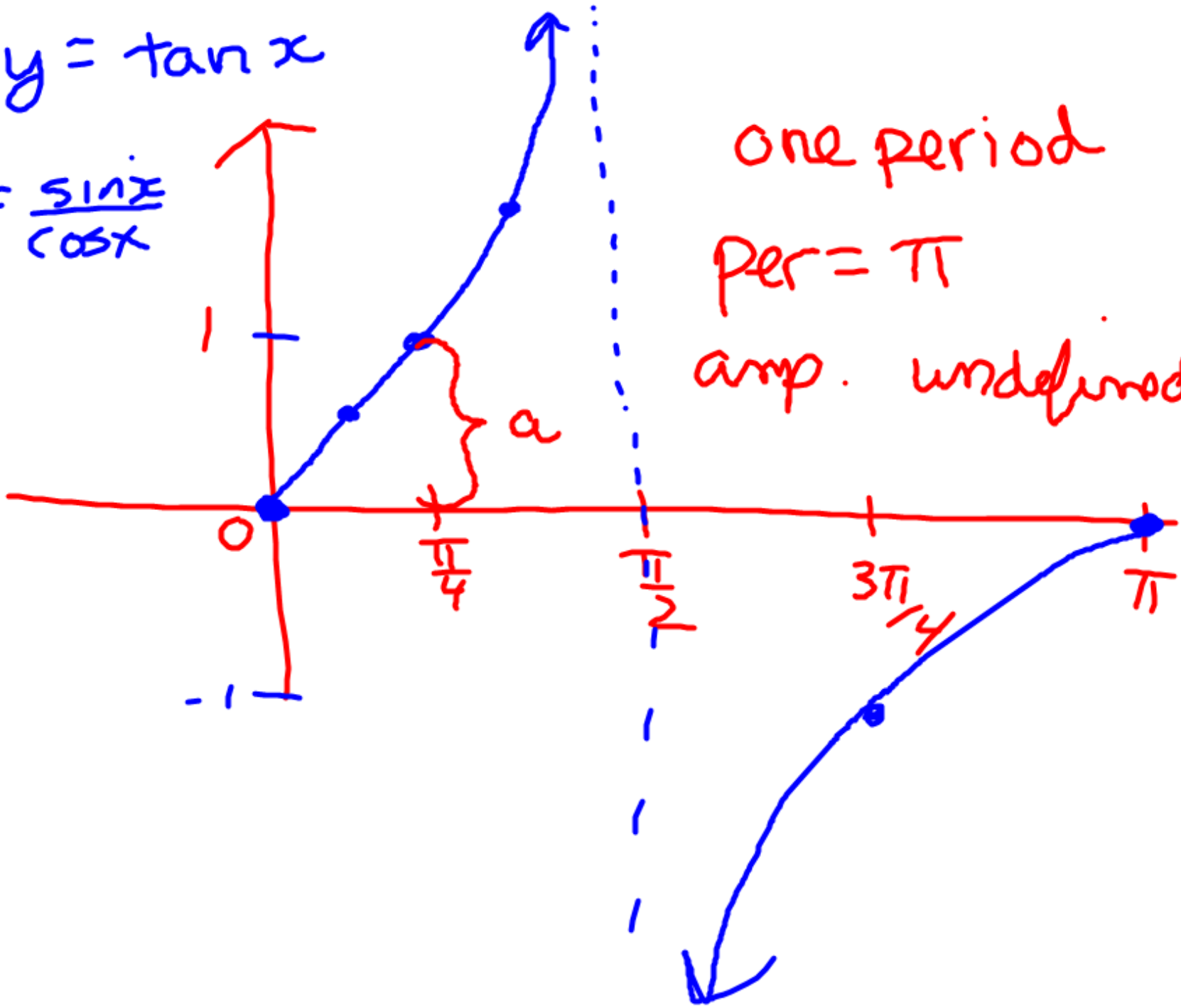
$$y = 10 \cos 4\left(x - \frac{\pi}{4}\right) - 3$$



5.3 The Tangent Function

$$y = \tan x$$

$$y = \frac{\sin x}{\cos x}$$



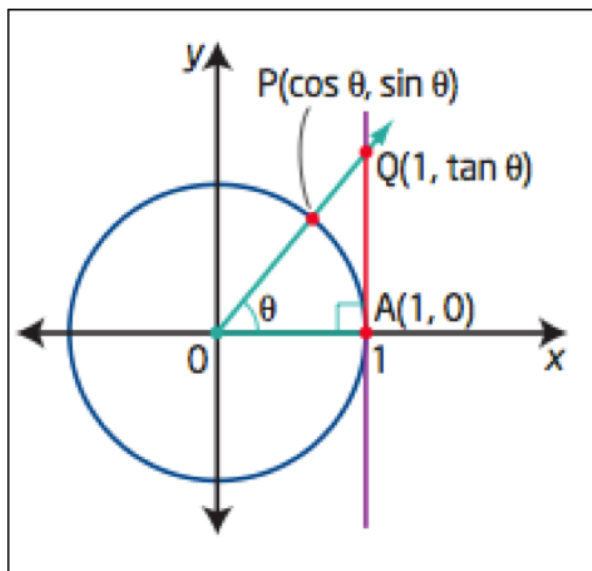
one period
Per = π
amp. undefined

Explore with desmos

Recall –From the unit circle, we know that

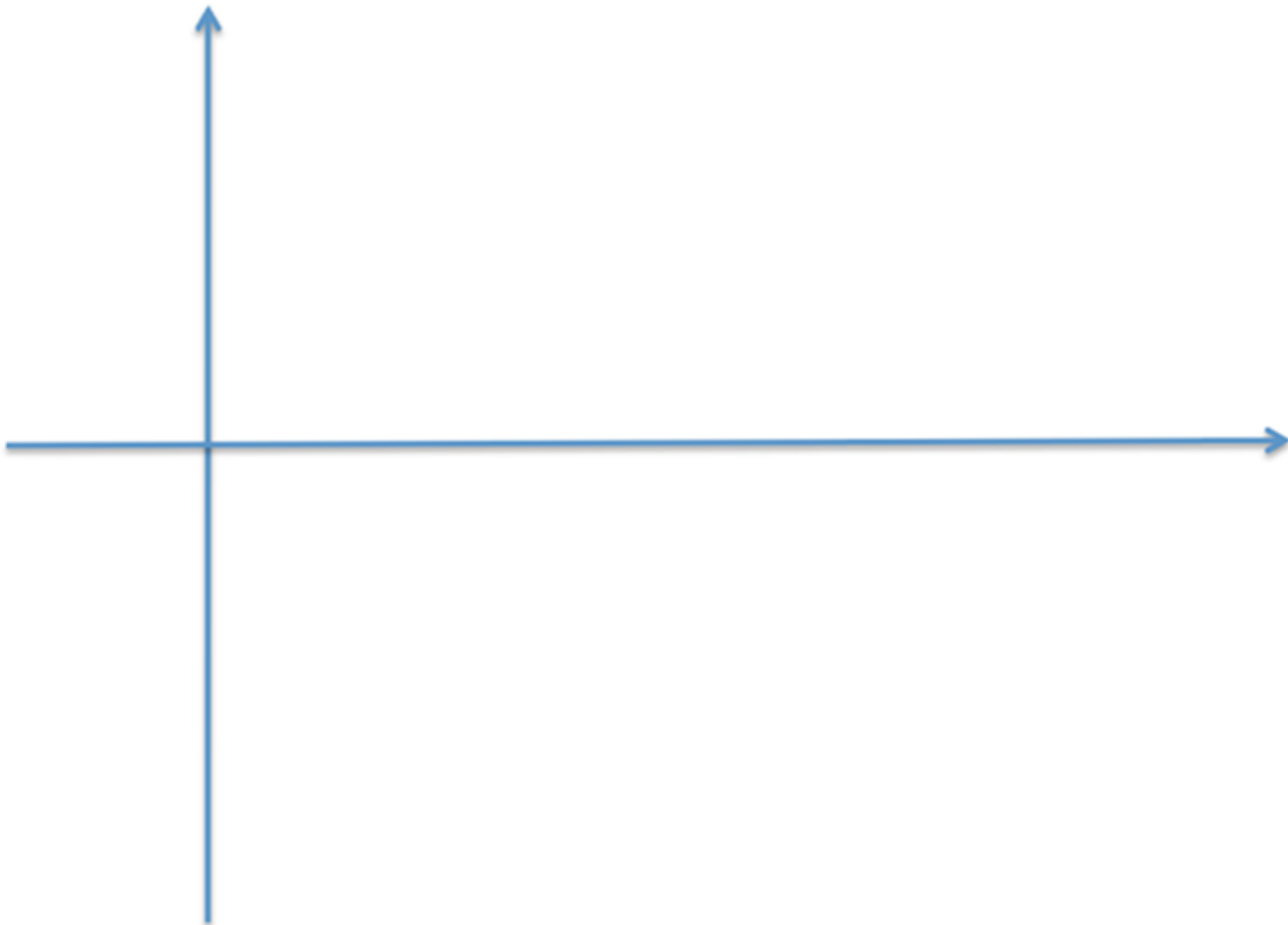
$$\tan \theta = \frac{y}{x}$$

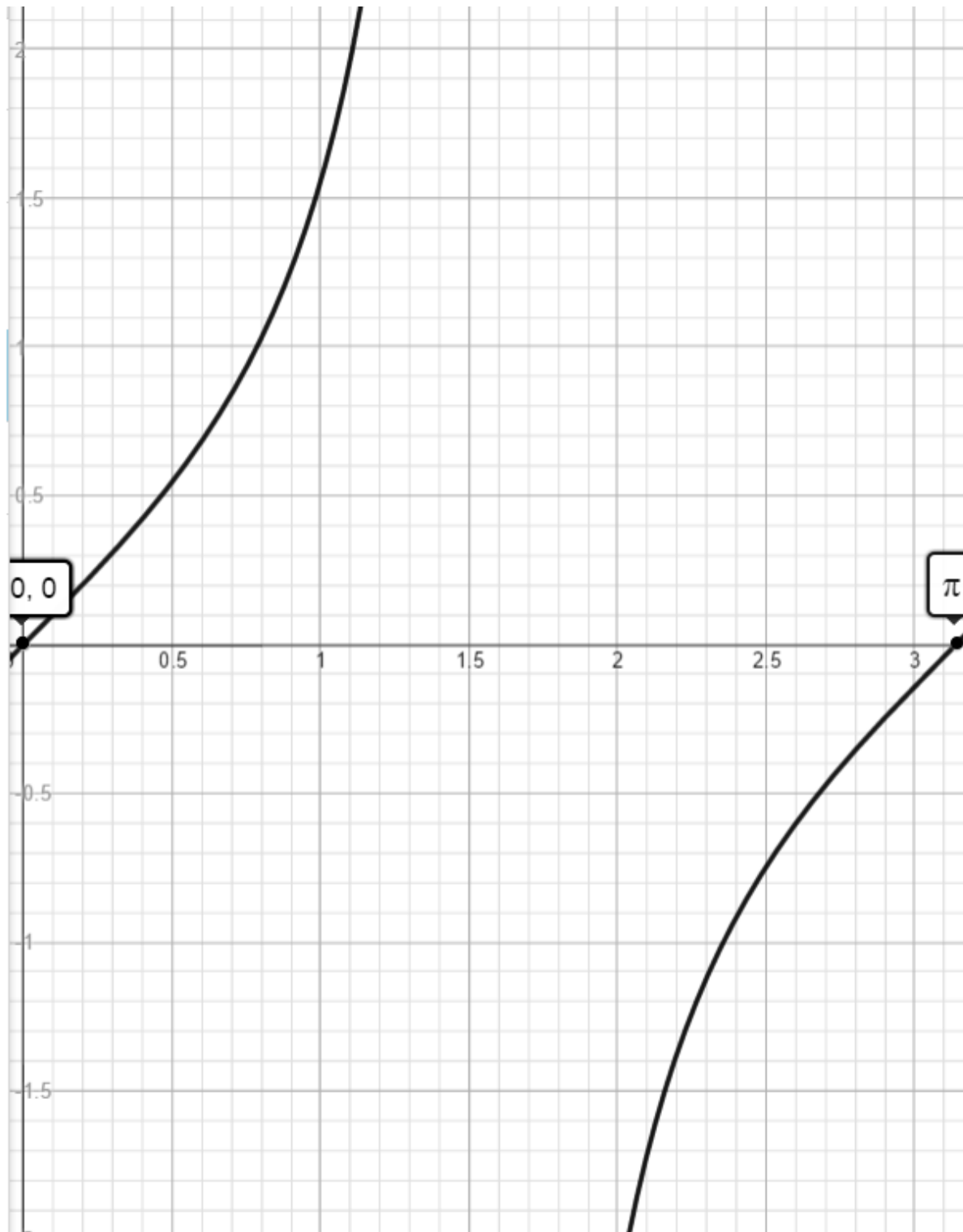
The value of the tangent of an angle θ is the slope of the line passing through the origin and the point on the unit circle $(\cos \theta, \sin \theta)$. You can think of it as the slope of the terminal arm of angle θ in standard position.



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

Draw one period for the graph $y=\tan x$.



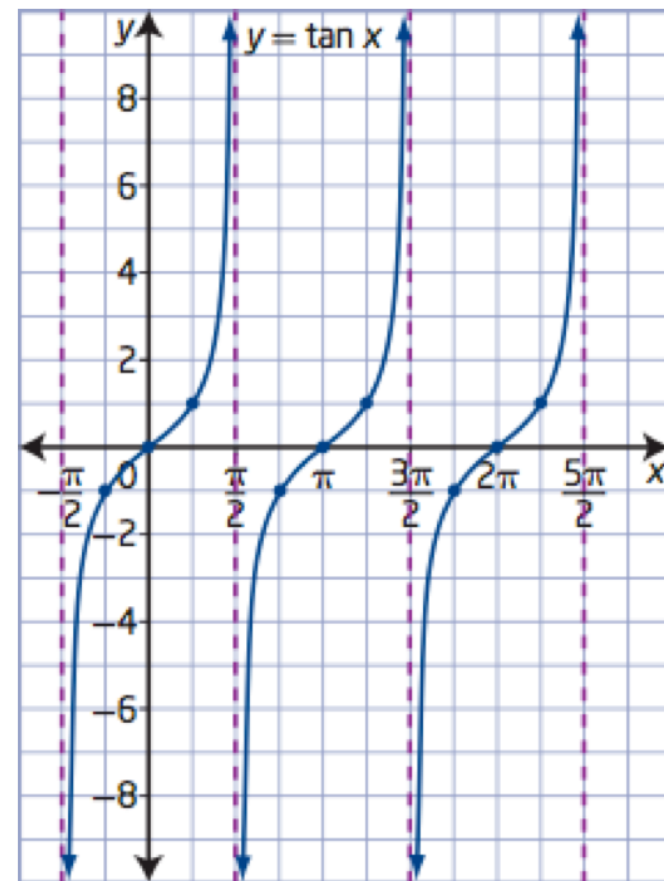


One period for our graph $y = \tan x$.

Characteristics of the Tangent Function

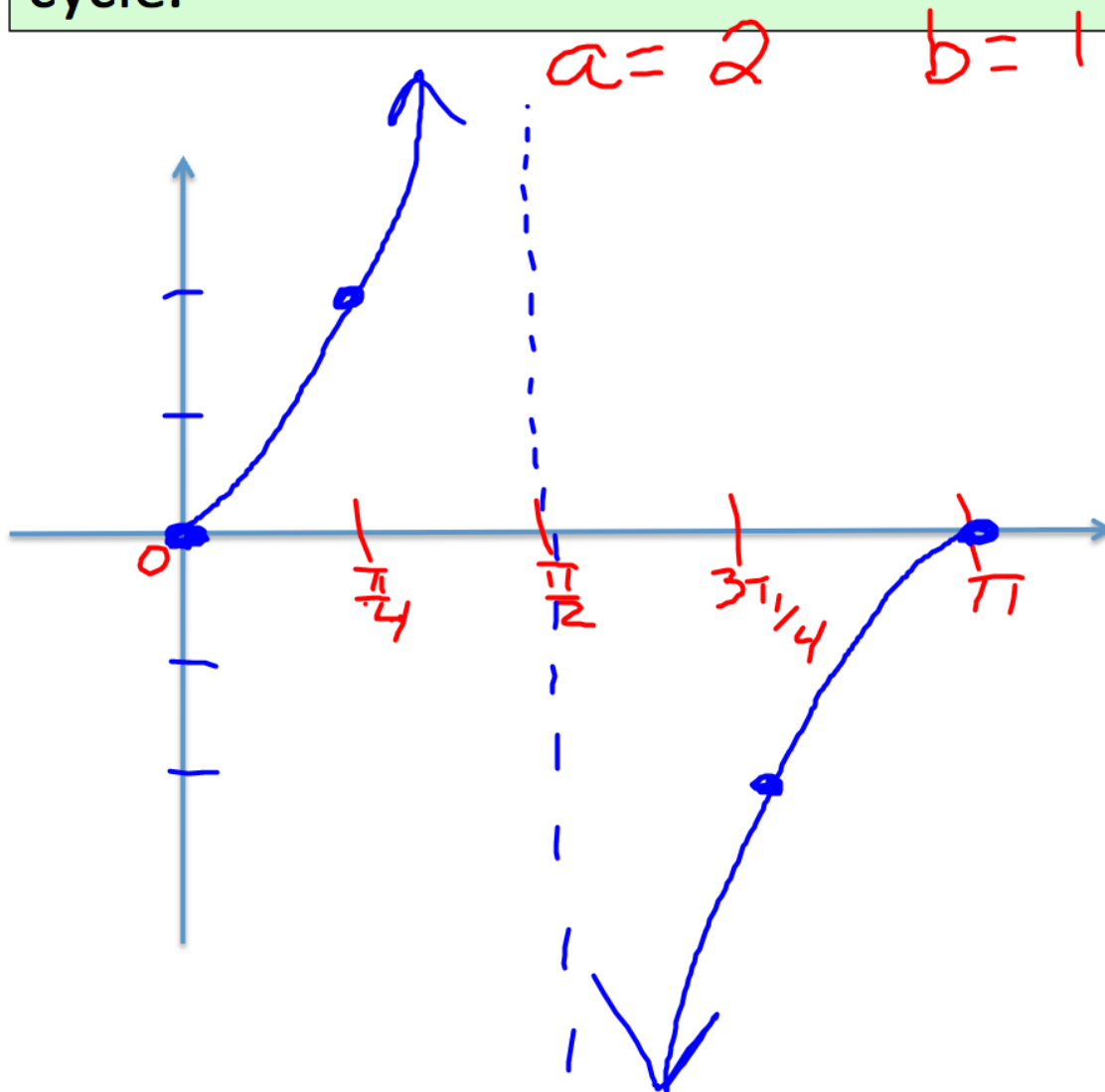
Compared to sine and cosine, tangent has some unique characteristics:

- The period is π .
- The graph has no maximum or minimum values.
- The range is $\{y \mid y \in \mathbb{R}\}$.
- Vertical asymptotes occur at $x = \frac{\pi}{2} + n\pi, n \in \mathbb{I}$.
- The domain is $\left\{x \mid x \neq \frac{\pi}{2} + n\pi, x \in \mathbb{R}, n \in \mathbb{I}\right\}$.
- The x -intercepts occur at $x = n\pi, n \in \mathbb{I}$.
- The y -intercept is 0.



$$\text{amp} = \infty \quad \text{per} = \frac{\pi}{b} = \pi$$

Example 2: Graph the function $y=2\tan x$ for one cycle.



critical #s

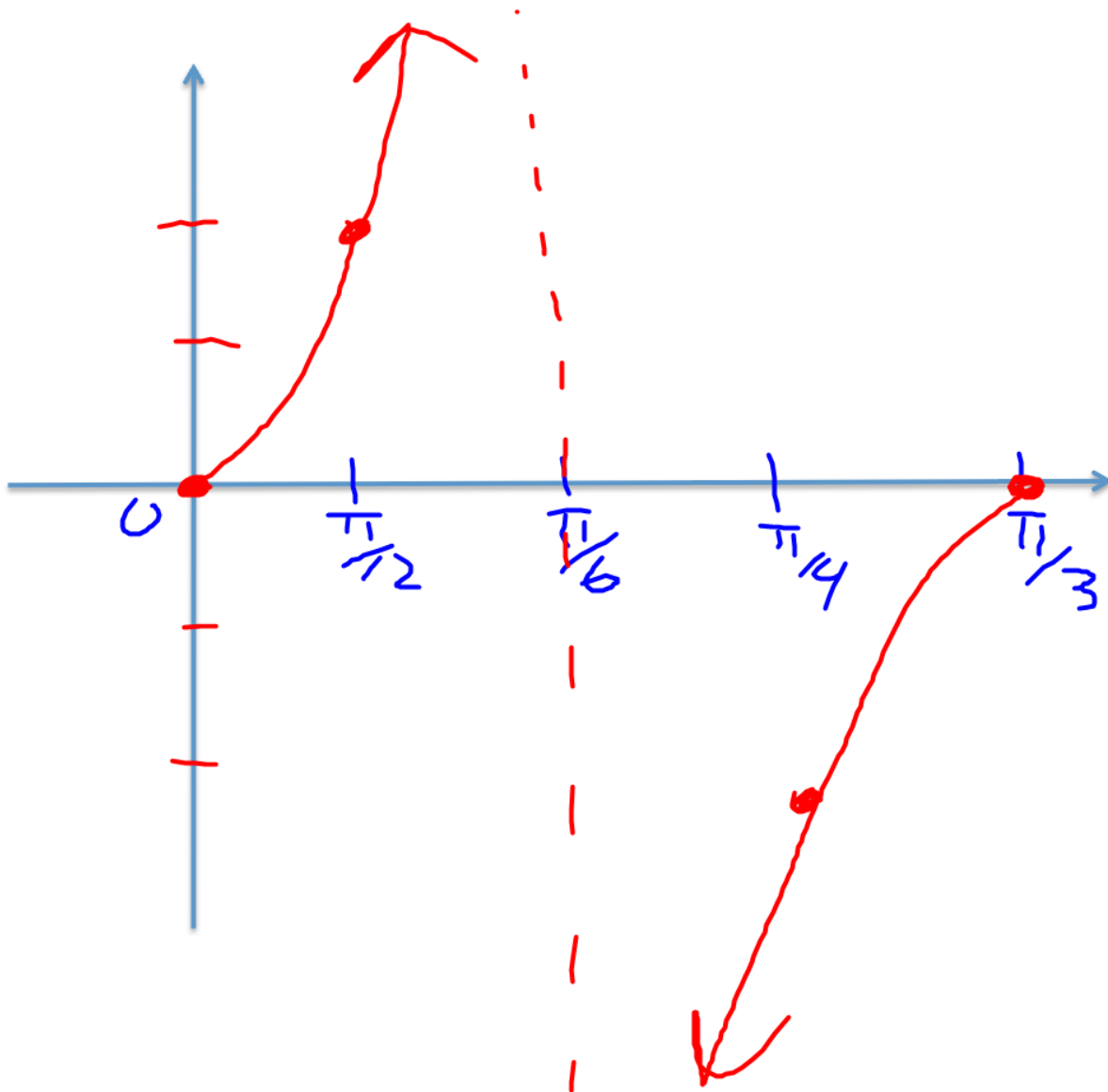
$$\pi \cdot \frac{1}{4} = \frac{\pi}{4}$$

$$0, \frac{\pi}{4}, \frac{2\pi}{4}, \frac{3\pi}{4}, \frac{4\pi}{4}$$

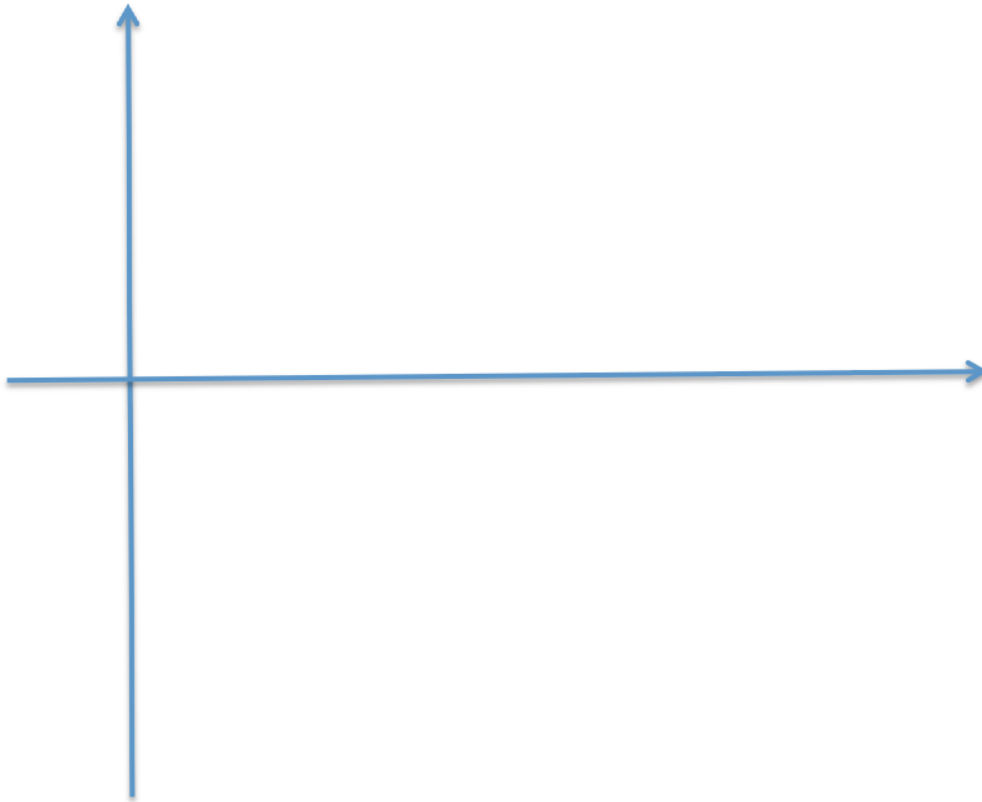
$a=2$ amp ∞ $b=3$ per = $\frac{\pi}{3}$

Example 3: Graph the function $y=2\tan 3x$

$\frac{\pi}{3} \cdot \frac{1}{4} = \frac{\pi}{12}$



Example 4: Graph the function $y = -3\tan\frac{1}{2}x$ for one cycle.



Assignment

$$B = \frac{\pi}{1} = 1$$

1) $y = 4 \tan x$

2) $y = -2 \tan 2x$

3) $y = \frac{1}{2} \tan 3x$

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

5) $y = -\frac{1}{4} \tan \frac{1}{3}x$

6) Determine the equation of the function from the graph shown.

