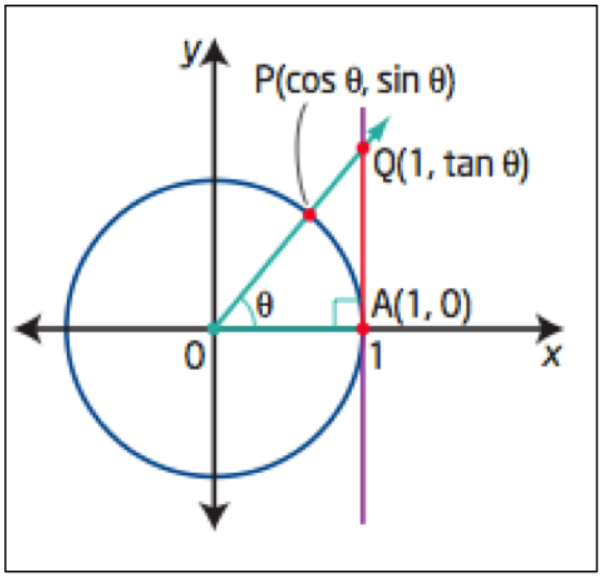
5.3 The Tangent Function

Explore with desmos

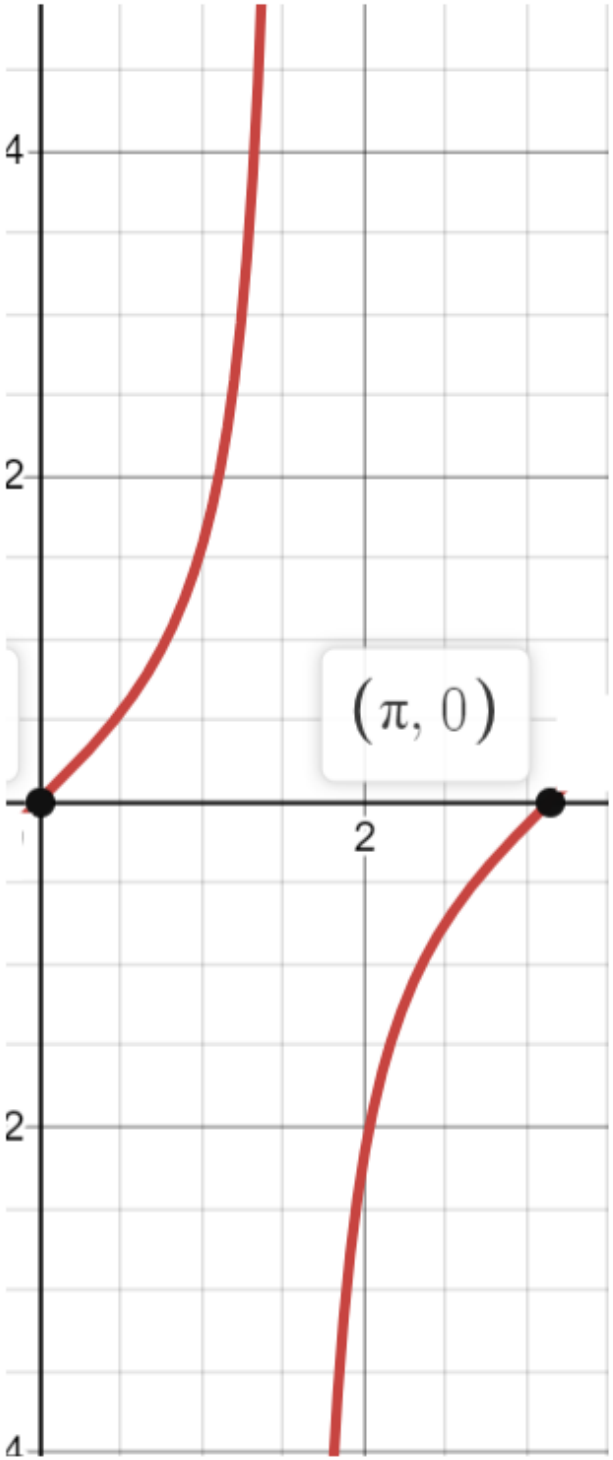
Recall –From the unit circle, we know that

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

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 θ, sin θ). You can think of it as the slope of the terminal arm of angle θ in standard position.



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



One period for our graph y=tanx.

This is what $y = \tan x$ looks like. On next slide we will show how to graph $y = \tan x$

Draw one period for the graph y=tanx.

amp = undefined

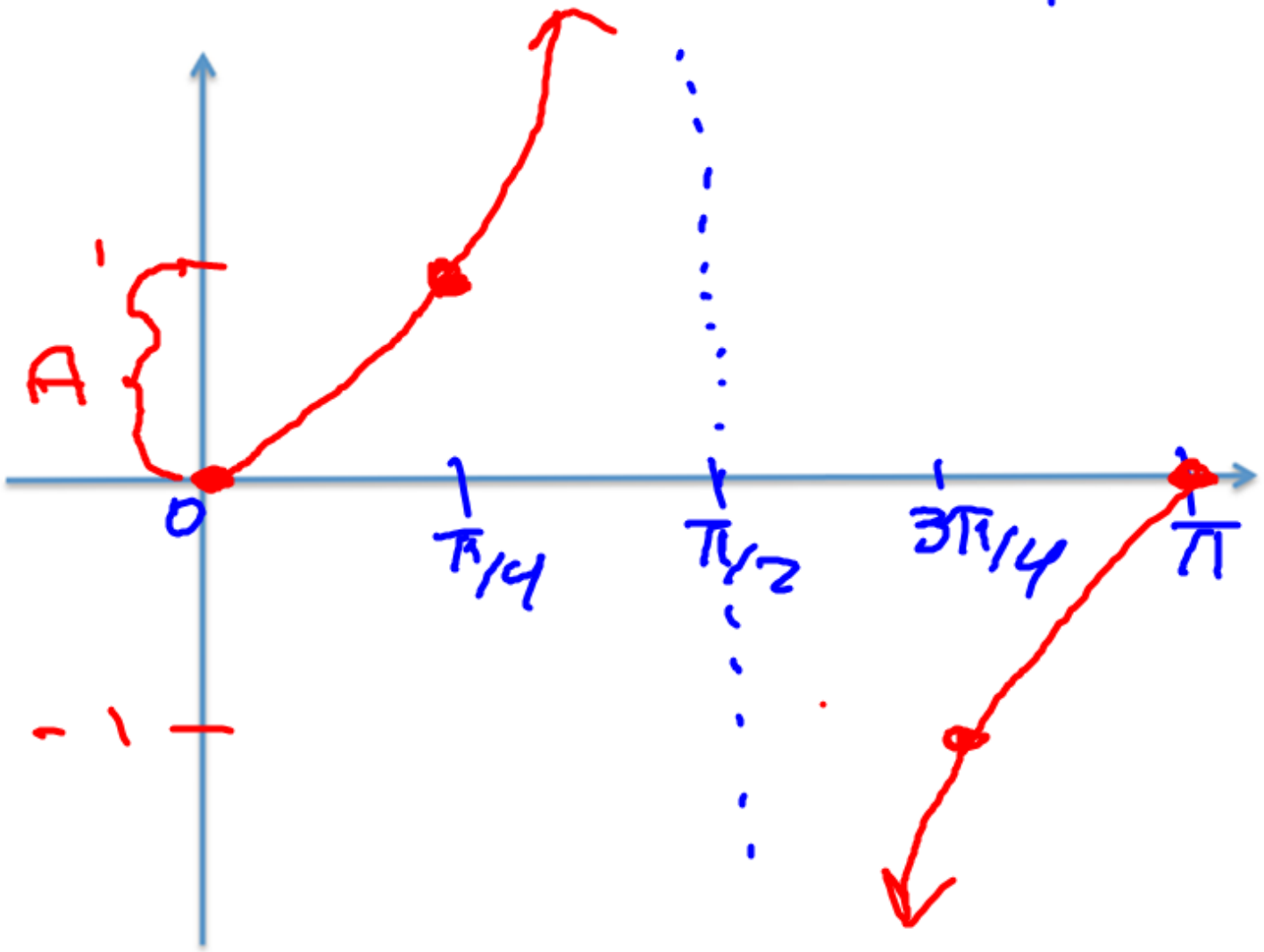
$per = \frac{\pi}{B} = \frac{\pi}{1} = \pi$

$(A = 1)$

per. $\frac{1}{4}$ $\pi/4$

critical #'s

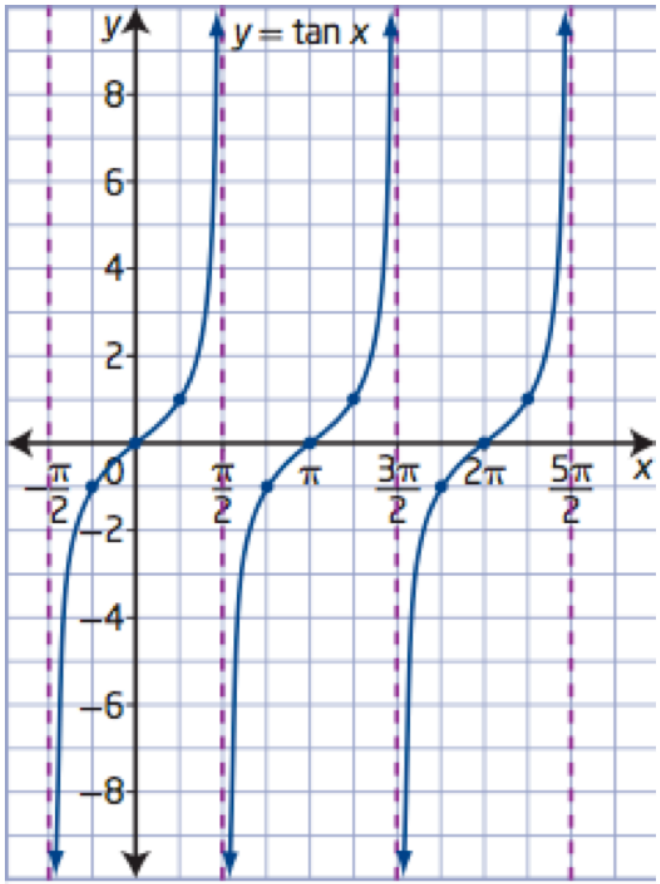
$0, \pi/4, 2\pi/4, 3\pi/4, 4\pi/4$



Characteristics of the Tangent Function

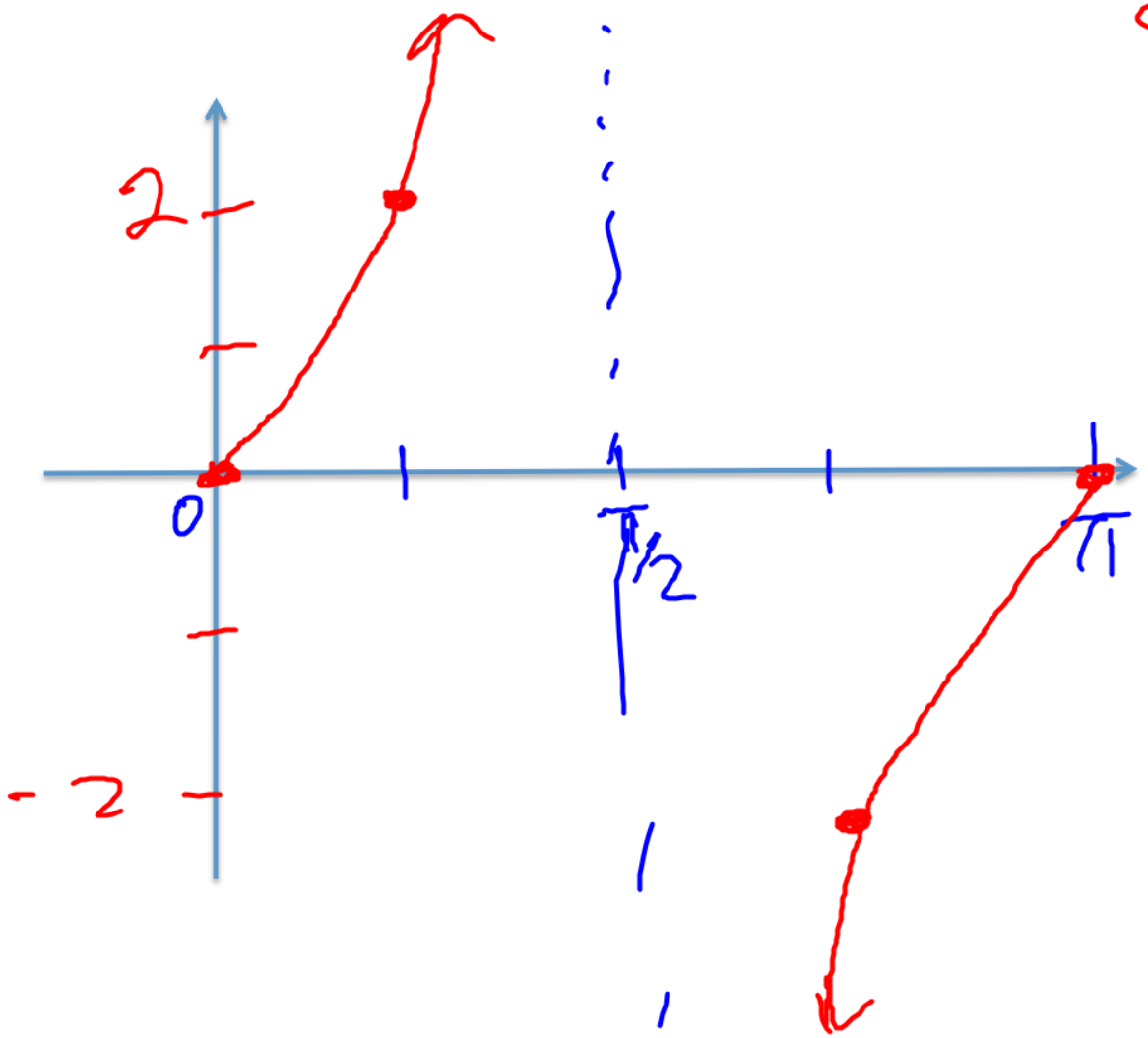
Compared to sine and cosine, tangent has some unique characteristics:

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



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

Example 2: Graph the function *y=2tanx* for one cycle.



amp = und. $A=2$

Per = π

critical #s

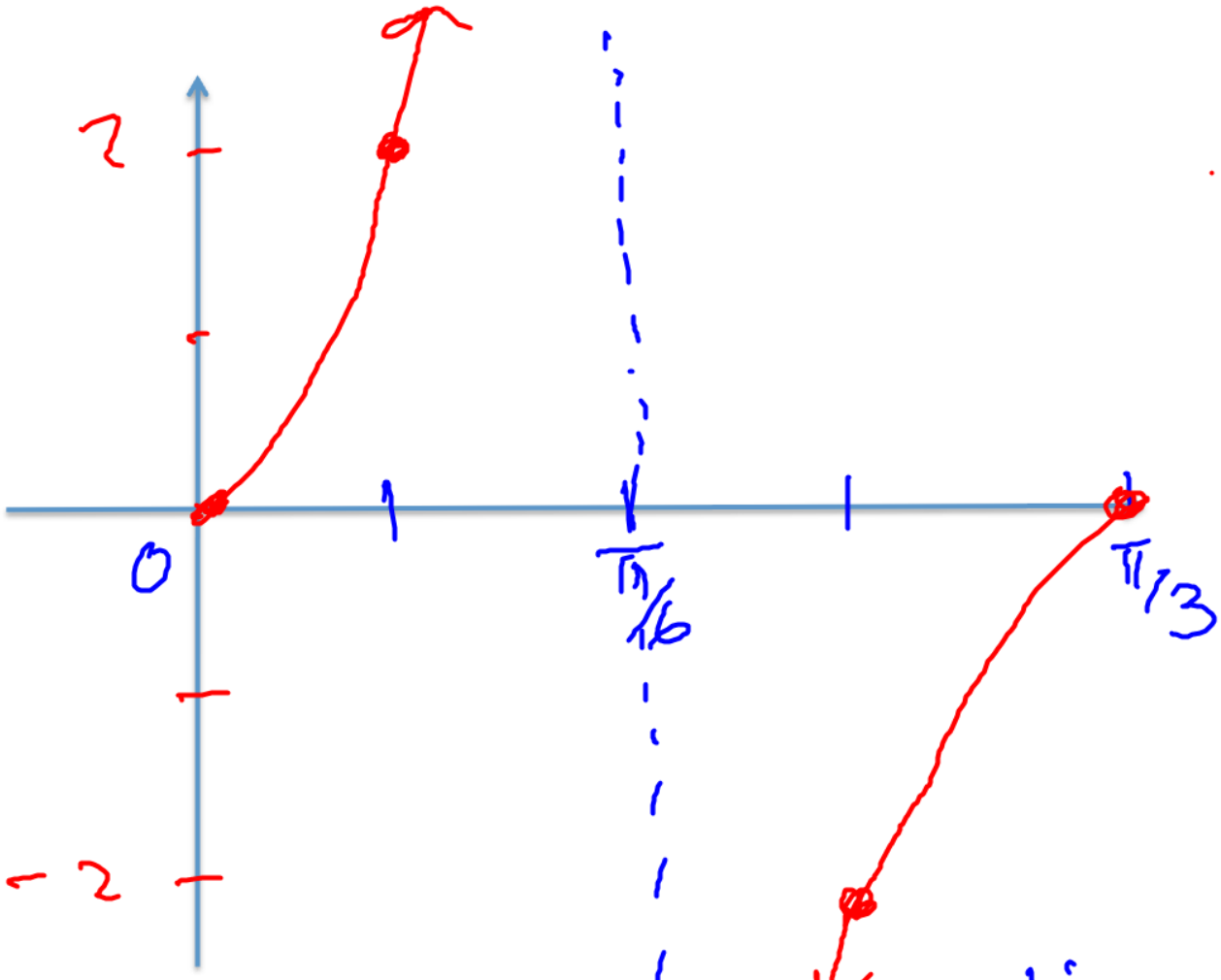
$0, \pi/4, \frac{2\pi}{4}, \frac{3\pi}{4}, \frac{4\pi}{4}$

amp = ∞ A = 2

per = π/3

π/3 · 1/4 = π/12

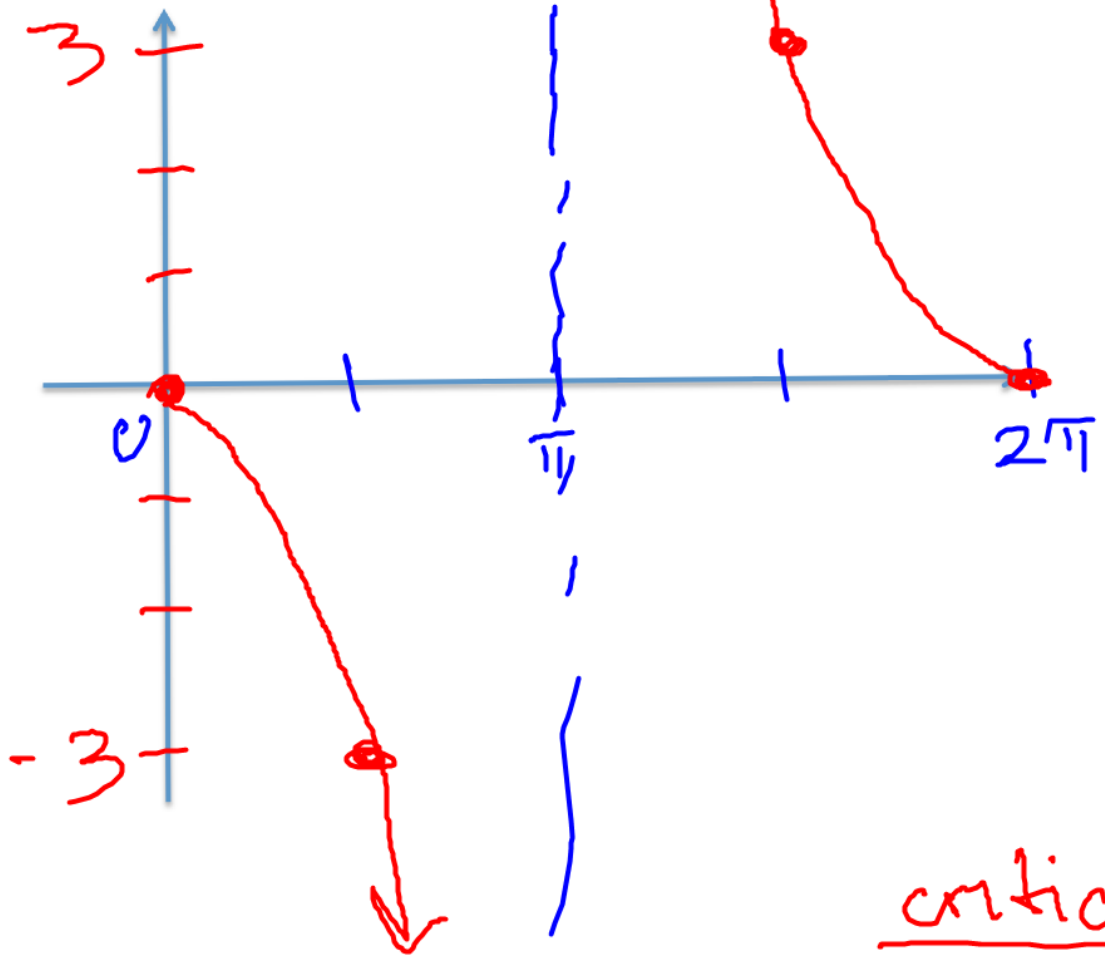
Example 3: Graph the function *y=2tan3x*



critical #'s

0, π/12, 2π/12, 3π/12, 4π/12

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



amp = ∞ (und)

A = -3

Per = 2π

$2\pi \cdot \frac{1}{4}$

$\pi/2$

critical #'s

$0, \pi/2, 2\pi/2, 3\pi/2, 4\pi/2$

Assignment

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.