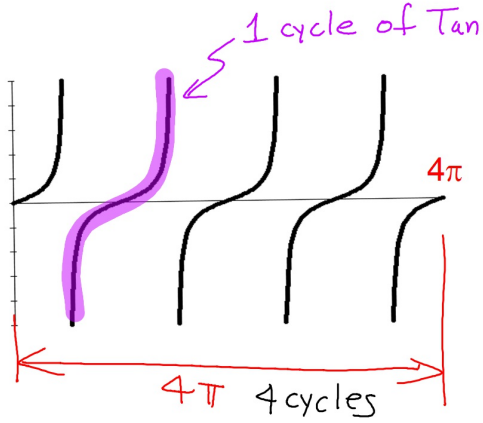
Sec 13-6: The Tangent Function

Graph the function $Y_1 = \text{Tan}x$

Use this Window: x:[0,4π] y:[-10, 10]

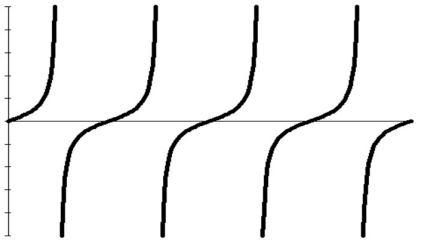


What is the period of the Tangent Function?

$\text{Period} = \frac{4\pi}{4} = \pi$

Why does the graph of

y = Tanθ look like this?



Using this definition of Tangent:

$\text{Tan}\theta = \frac{y}{x}$

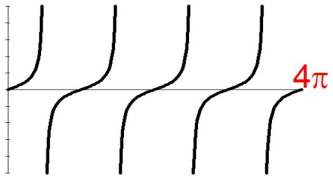
When the numerator = 0

Tanθ = 0 and there is an x-intercept

When the denominator = 0

Tanθ is undefined and there is a Vertical Asymptote

The Parent Tangent Function: y = Tanx



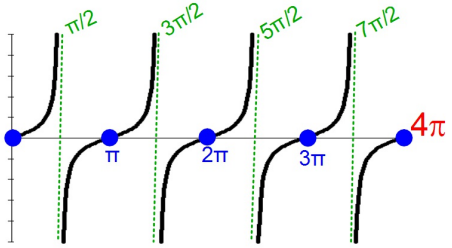
Period of Tanθ = π

this means every π units left or right from any point you get the same result.

What are the x-intercepts?

1ST X-INT = 0

Keep adding π to find more x-int



What are the Eq's of the Vertical Asymtpotes?

The 1ST VA is exactly in the middle of the first two x-int (their avg)

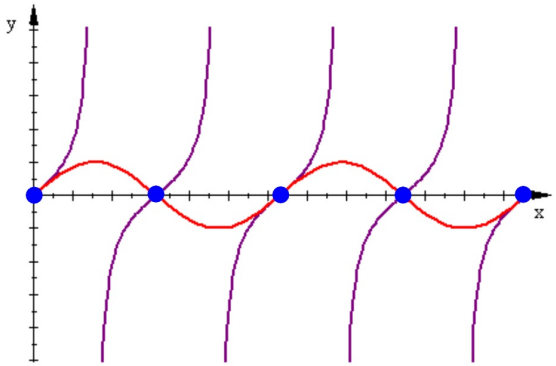
1st VA = $\frac{0+\pi}{2} = \frac{\pi}{2}$

You can keep adding π to find more VA.

Another definition of Tan:

$$\text{Tan}\theta = \frac{y}{x} = \frac{\text{Sin}\theta}{\text{Cos}\theta}$$

Leave Y_1 = Tanx. Graph Y_2 = Sinx.

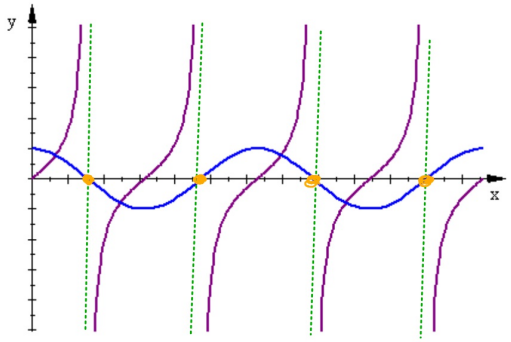


How is the graph of Tanx related to the graph of Sinx?

Tanx is zero whenever Sinx is zero.

In other words, Tanx has x-intercepts where ever Sinx has x-intercepts.

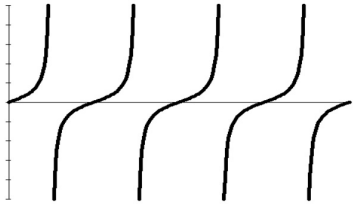
Leave Y_1 = Tanx. Graph Y_2 = Cosx.



How is the graph of Tanθ related to the graph of Cosθ?

Tanθ has a VA whenever Cosθ is zero (x-int).

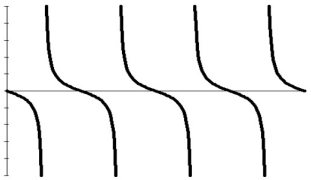
y = Tanx



Since Tanx = $\frac{y}{x}$
you can remember which way y=Tanx moves if you relate it to slope.
A positive Tanx moves up and to the right like a line with a positive slope.

y = aTanx a: If a<0 there is an x-axis reflection

A negative Tanx,
just like negative slope, moves down and to the right.



a is also a Vertical Stretch or Shrink Factor but.....
there are really no obvious points to define how "tall" the Parent Tangent function is. Therefore, we will only concern ourselves with whether a is positive or negative.

y = Tan(bx)

Just like for Sin and Cos b represents a Horizontal Stretch or Shrink.

For Sin and Cos b was related to the period in the following ways:

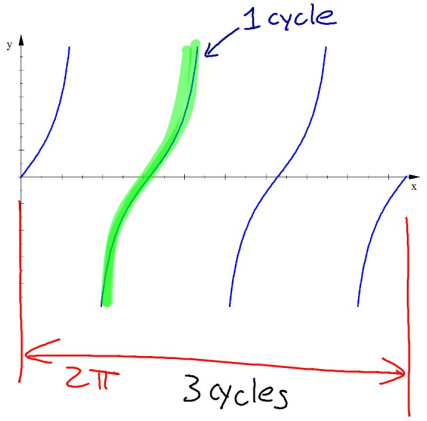
Period = $2\pi/b$ and $b = 2\pi/\text{period}$

There is a similar relationship with Tangent:

b: The period of Tanbx = $\frac{\pi}{b}$

$b = \frac{\pi}{\text{period}}$

The Tangent function is graphed in the window 0 to 2π.



1. What is the period?

$\frac{2\pi}{3} \div \frac{2\pi}{3}$

2. What is the equation of this Tangent Function?

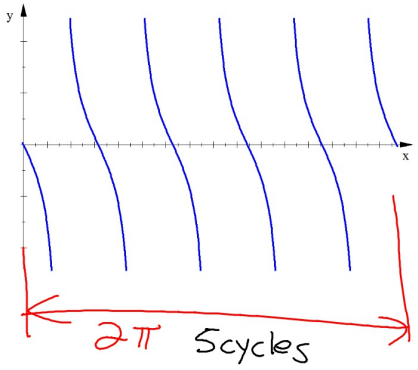
$b = \frac{\pi}{\frac{2\pi}{3}} = \pi \cdot \frac{3}{2\pi}$

$b = 3/2$

Cycles move up & to the right: POS Tan

$y = \text{Tan}\frac{3x}{2}$

The Tangent function is graphed in the window 0 to 2π.



1. What is the period?

$\frac{2\pi}{5} \div \frac{2\pi}{5}$

2. What is the equation of this Tangent Function?

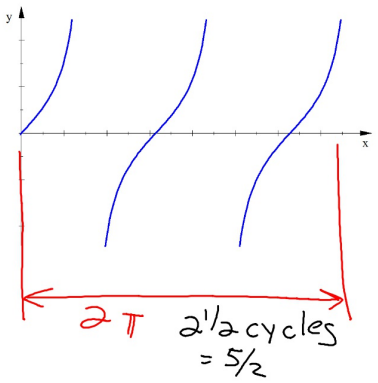
$b = \frac{\pi}{\frac{2\pi}{5}} = \pi \cdot \frac{5}{2\pi}$

$b = \frac{5}{2}$

Cycles move down & to the right: NEG Tan

$y = -\text{Tan}\frac{5x}{2}$

The Tangent function is graphed in the window 0 to 2π.



1. What is the period?

$\frac{2\pi}{5/2} = 2\pi \cdot \frac{2}{5} = \frac{4\pi}{5}$

2. What is the equation of this Tangent Function?

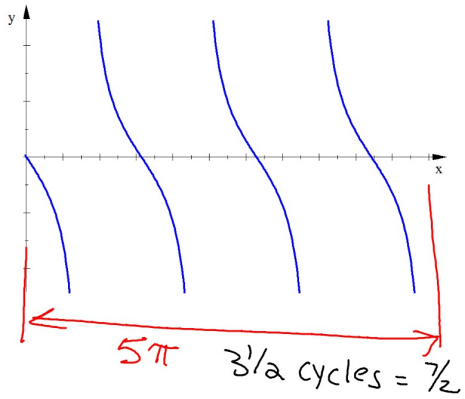
$b = \frac{\pi}{\frac{4\pi}{5}} = \pi \cdot \frac{5}{4\pi}$

$b = \frac{5}{4}$

cycles move up & to the right: Pos Tan

$y = \text{Tan}\frac{5x}{4}$

The Tangent function is graphed in the window 0 to 5π.



1. What is the period?

$\frac{5\pi}{\frac{7}{2}} = 5\pi \cdot \frac{2}{7} = \frac{10\pi}{7}$

2. What is the equation of this Tangent Function?

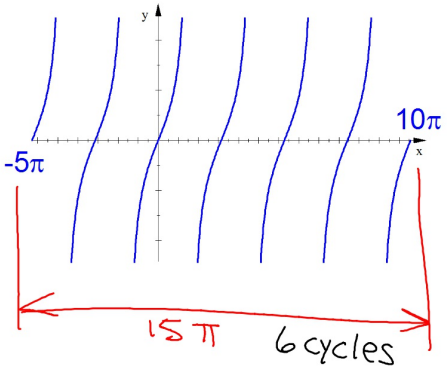
$b = \frac{\pi}{\frac{10\pi}{7}} \cdot \pi \cdot \frac{7}{10\pi}$

$b = \frac{7}{10}$

cycles move down & to the right: NEG Tan

$y = -\tan\frac{7x}{10}$

Write the equation of this Tangent Function



period $= \frac{10\pi}{6} = \frac{5\pi}{2}$

$b = \frac{\pi}{\frac{5\pi}{2}} = \pi \cdot \frac{2}{5\pi}$

$b = \frac{2}{5}$

cycles move up & to the right: Pos Tan

$y = \tan\frac{2x}{5}$