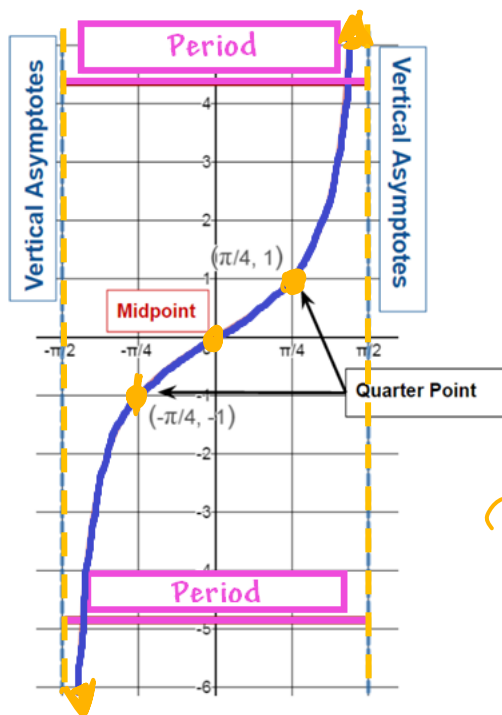# Graphing Tangent and its BFF

Sine and **Cosine** look a lot alike however **Tangent** looks totally different!

Period of tangent is π

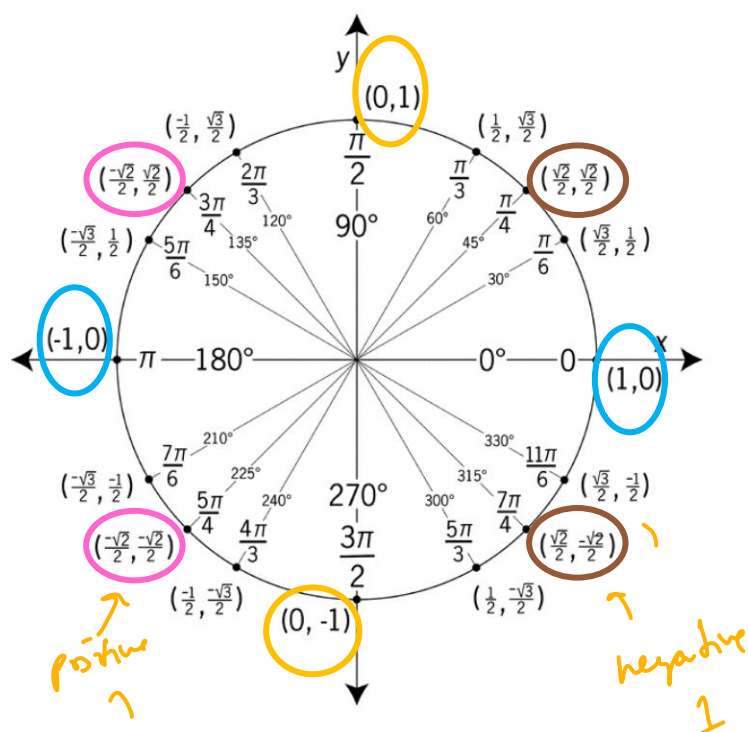**Let's analyze the unit circle and find where**

tangent = 0 and
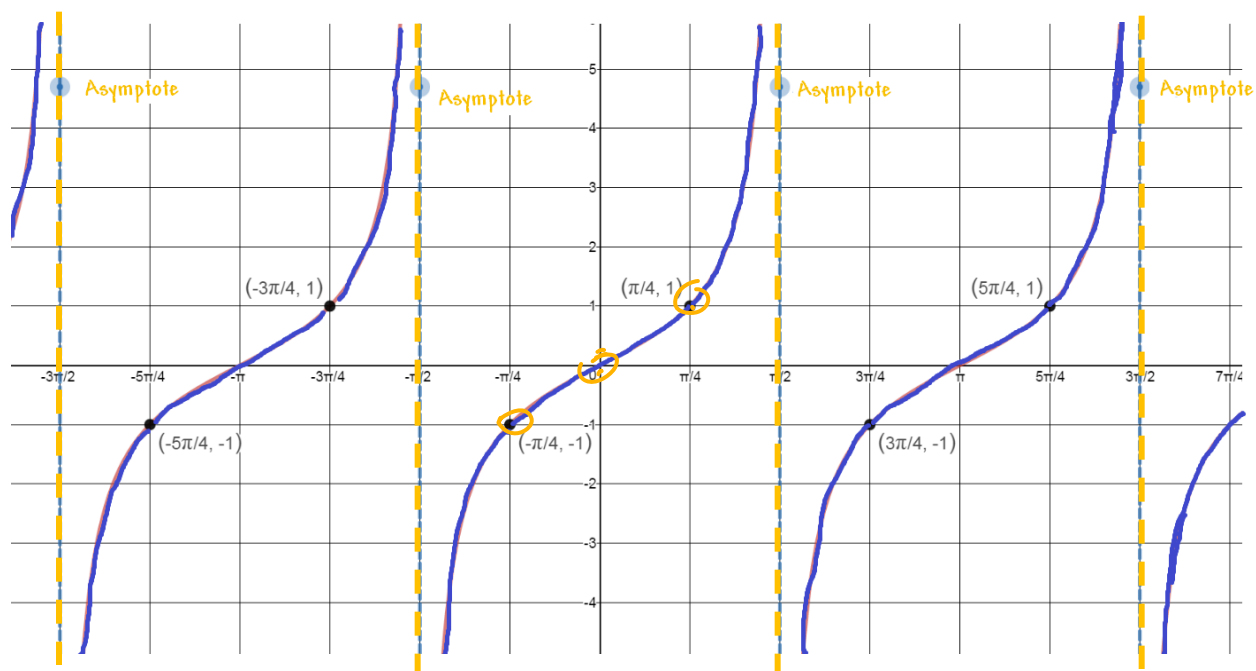
tangent = undefined

tangent = -1

tangent = 1

Remember $\tan\theta = \dfrac{y}{x}$

Go ahead and graph Tangent in your calculator

We can see that when cosine = 0 then tangent has an asymptote

Click Here

Trigonometry Animated Gif's

Again we have the Period, Amplitude, Phase Shift and Vertical Shifts

We can have all of these items in one equation so instead of graphing

$$f(x) = \tan x$$

We have this:

$$f(x) = A\tan(Bx - C) + D$$

That's a lot of letters, but don't worry you can figure this out.

Play with the graph found at the link below and list what the letters do

https://www.desmos.com/calculator/flrpesfnxm

A: How high the 'low point' (first quarter point) n 'high point' (3rd quarter point)

B: The # of waves in one period

C: Horizontal shift

D: Vertical shift

Each of the values A, B, C and D all help to find things about the graph

$$f(x) = A\tan(Bx - C) + D$$

Amplitude:

How high the graph goes (If A is negative it flips the graph also)

Overall Period:

Frequency how many wave in one cycle

Phase Shift:

Moving the graph left or right

Vertical Shift:

Moving the midpoint up or down

Check it Out:

$$f(x) = -5\tan(3x - 3\pi) + 5$$

$$A = -5 \qquad B = 3 \qquad C = 3\pi \qquad D = 5$$

$$\text{Amplitude} = |A| = |-5| = 5$$

Height of wave will be 2, because $A = -5$ **the graph will be flipped over the x-axis**

$$\text{Overall Period} = \frac{period}{B} = \frac{\pi}{3}$$

One complete wave will happen in length π/3

Phase Shift $= \dfrac{C}{B} = \dfrac{3\pi}{3} = \pi$

The graph will begin the wave at x = π

Vertical Shift = D = 5

The graph will shift up 5 units

So what about Tangent's best friend… Cotangent what does it look like?

We know $\cot \theta = \dfrac{x}{y}$

So when sine = 0 then cotangent has an asymptote, so again the graph is flipped just like all the other best friend graphs

Learn about cotangent by exploring the desmos graph

https://www.desmos.com/calculator/39ctnqihdw