$$y = \frac{x+1}{x^2-9}$$

$(x+3)(x-3)$

Find the Vertical Asymptotes of this Rational
Function: zeros of the denominator

$x = \pm 3$

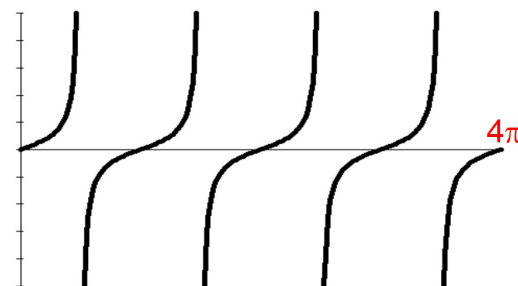Find the zeros of this function (x-intercepts): $0 = \frac{x+1}{x^2-9}$
zeros of the numerator.

$x\text{-}int = -1$

Sec 13-6: The Tangent Function

Graph the function $y = \tan\theta$

Use this Window: x:[0,4π]   y:[-10, 10]
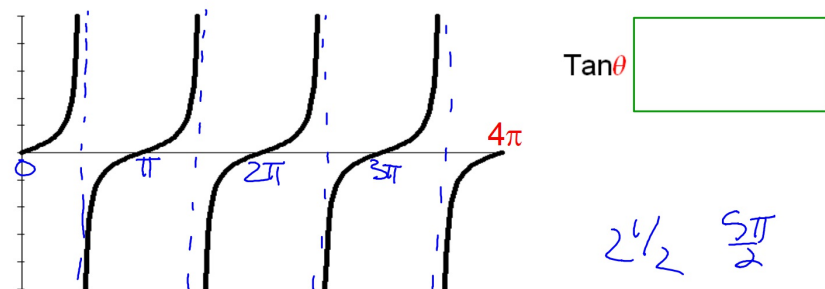
What is the period of the Tangent Function?

4π

What is the period of
the Tangent Function?

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

What is the period of Tanθ?
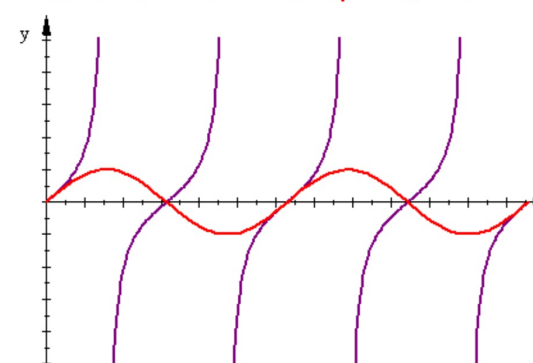
Panel 1 (top-left)

Tanθ [box]

4π

$2\frac{1}{2}$ $\frac{5\pi}{2}$

What are the x-intercepts? $0, \pi, 2\pi, 3\pi, 4\pi$

What are the Vertical Asymtpotes? $\frac{\pi}{2}, \frac{3\pi}{2}, \frac{5\pi}{2}$

Panel 2 (top-right)

Leave Y_1 = Tanx. Graph Y_2 = Sinx.
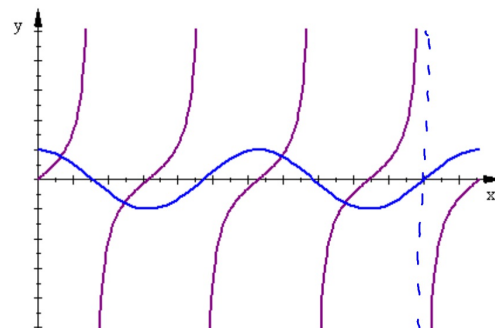
$Tan\theta = \dfrac{Sin\theta}{Cos\theta}$

y

x

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

Tanx is zero whenever Sinx is zero.

Panel 3 (bottom-left)

Leave Y_1 = Tanx. Graph Y_2 = Cosx.

$Tan\theta = \dfrac{Sin\theta}{Cos\theta}$

y

x

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

Tanθ has a VA whenever Cosθ is zero.

Panel 4 (bottom-right)

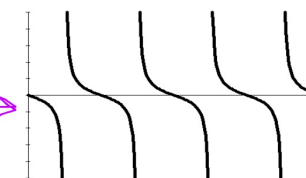$y = a\text{Tan}(bx) = a\left(\dfrac{Sin(bx)}{Cos(bx)}\right)$

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

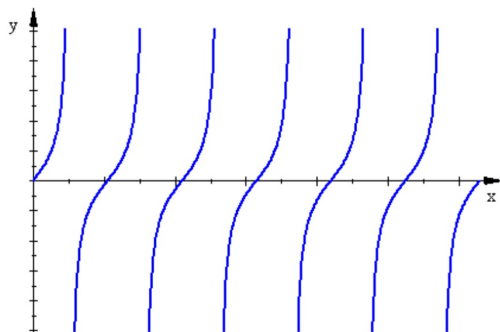b: The period of Tanbx = $\dfrac{\pi}{b}$

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

VA occur wherever Cos(bx)=0

x-int occur wherever Sin(bx)=0

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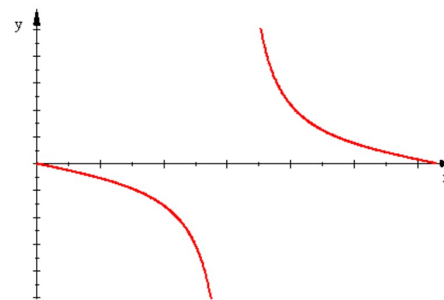

$a \to pos$

1. What is the period?

$$\frac{2\pi}{6} = \frac{\pi}{3}$$

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

2. What is the equation of this Tangent Function?

$$y = \tan 3x$$

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

$a \to neg$

1. What is the period?

$$2\pi$$

$$b = \frac{\pi}{2\pi} = \frac{1}{2}$$

2. What is the equation of this Tangent Function?

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

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

$a \to pos$

1. What is the period?

$$\frac{2\pi}{8} = \frac{\pi}{4}$$

$$b = 4$$

2. What is the equation of this Tangent Function?

$$y = \tan 4x$$

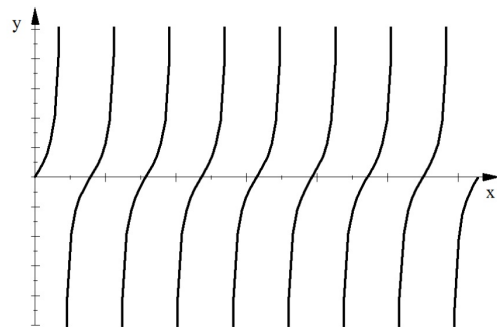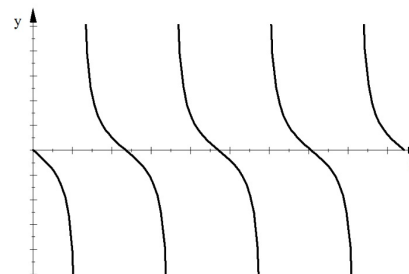**The Tangent function is graphed in the window 0 to 6π.**

$a \to neg$

1. What is the period?

$$\frac{6\pi}{4} = \frac{3\pi}{2}$$
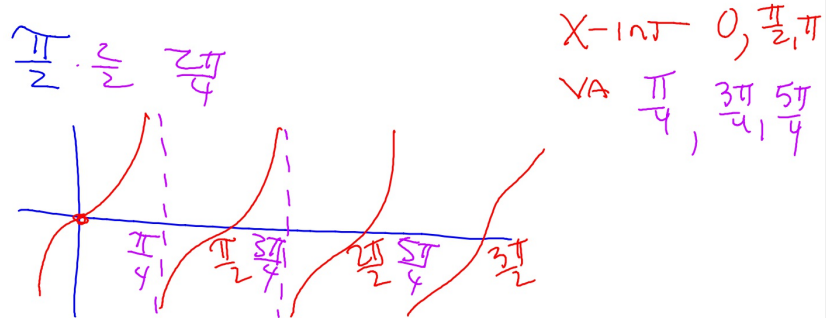
$$b = \frac{\pi}{\frac{3\pi}{2}} = \pi \cdot \frac{2}{3\pi}$$

2. What is the equation of this Tangent Function?

$$\boxed{y = -\tan \frac{2}{3}x}$$

y = Tan(2θ)

Find three VA and three x-int.

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

X-int $0, \frac{\pi}{2}, \pi$

VA $\frac{\pi}{4}, \frac{3\pi}{4}, \frac{5\pi}{4}$

$\frac{\pi}{4}$ $\frac{\pi}{2}$ $\frac{3\pi}{4}$ $\frac{2\pi}{2}$ $\frac{5\pi}{4}$ $\frac{3\pi}{2}$

$$y = \text{Tan}\frac{4\theta}{3}$$

Find three VA and three x-int.

$$\frac{3\pi}{4}$$

$\frac{9\pi}{8}$ $15\pi/8$

$\frac{3\pi}{8}$ $\frac{3\pi}{4}$ $\frac{6\pi}{4}$

X-int $0, \frac{3\pi}{4}, \frac{3\pi}{2}$

VA $\frac{3\pi}{8}$)