

# BOARD NOTES

14 FEBRUARY 2019



# CC TRIGONOMETRY

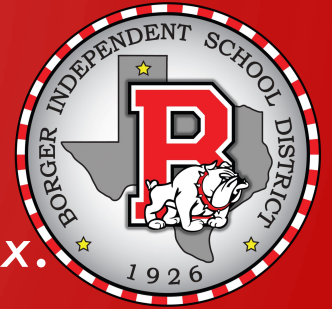
## CHAPTER 2 – GRAPHS OF THE TRIGONOMETRIC FUNCTIONS; INVERSE TRIGONOMETRIC FUNCTIONS

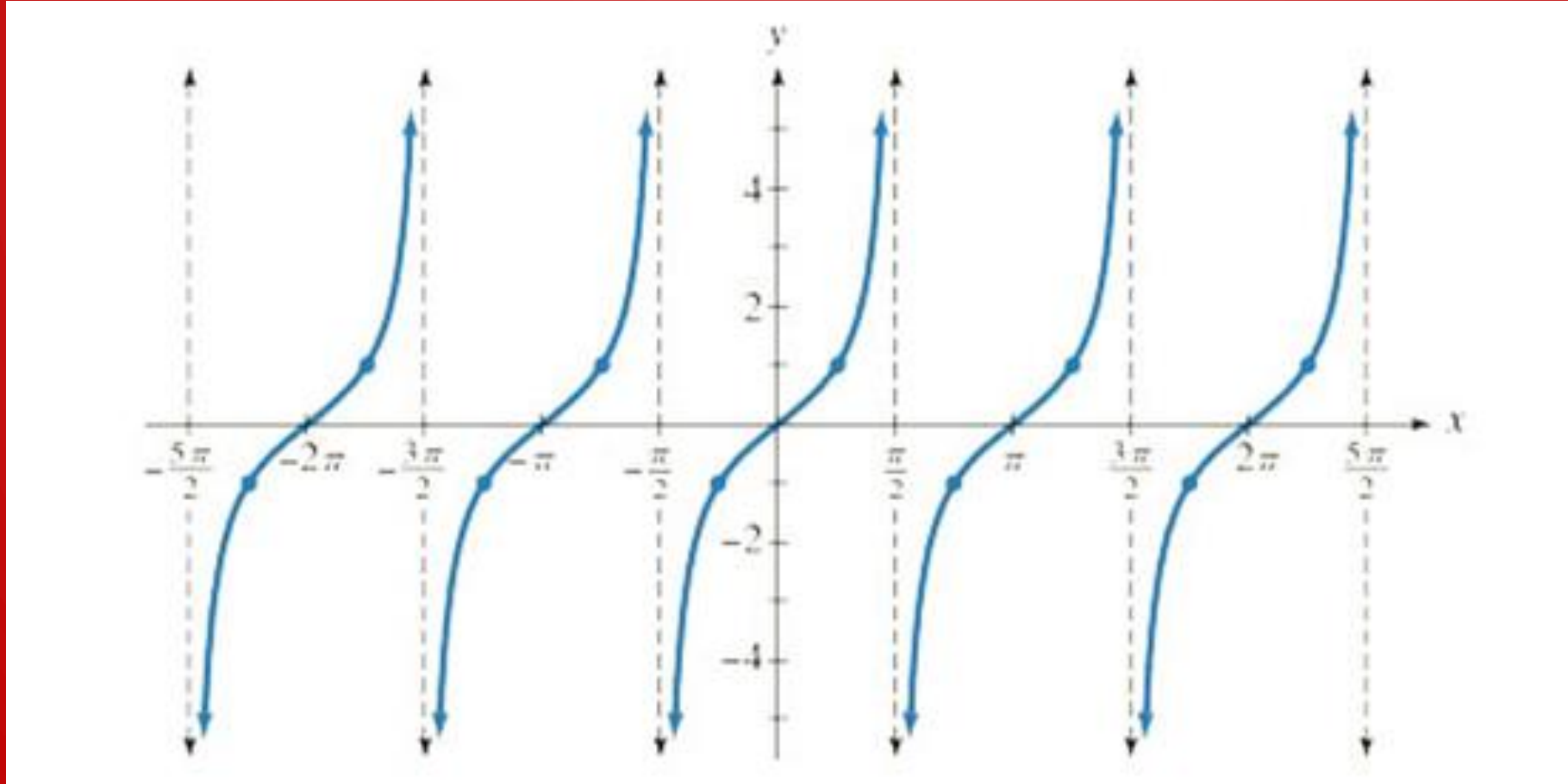


### SECTION 2.2 - Graphs of Other Trigonometric Functions

#### Objectives:

- Understand the graph of  $y = \tan x$ .
- Graph variations of  $y = \tan x$ .
- Understand the graph of  $y = \cot x$ .
- Graph variations of  $y = \cot x$ .
- Understand the graph of  $y = \sec x$  &  $y = \csc x$ .
- Graph variations of  $y = \sec x$  &  $y = \csc x$ .





# The Graph of $y = \tan x$

$x$	0	$\frac{\pi}{6}$	$\frac{\pi}{4}$	$\frac{\pi}{3}$	$\frac{5\pi}{12}$ ( $75^\circ$ )	$\frac{17\pi}{36}$ ( $85^\circ$ )	$\frac{89\pi}{180}$ ( $89^\circ$ )	1.57	$\frac{\pi}{2}$
$y = \tan x$	0	$\frac{\sqrt{3}}{3} \approx 0.6$	1	$\sqrt{3} \approx 1.7$	3.7	11.4	57.3	1255.8	undefined

As  $x$  increases from 0 toward  $\frac{\pi}{2}$ ,  $y$  increases slowly at first, then more and more rapidly.

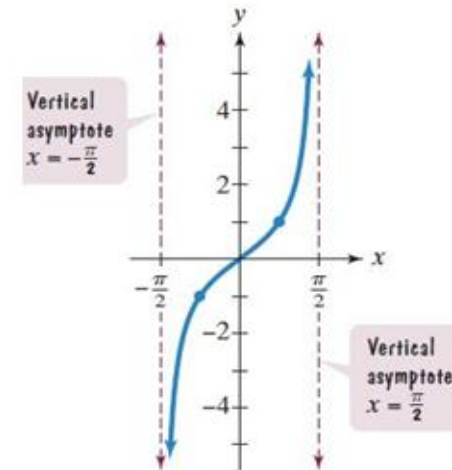
Period:  $\pi$

The tangent function is an odd function.

$$\tan(-x) = -\tan x$$

The tangent function is undefined at

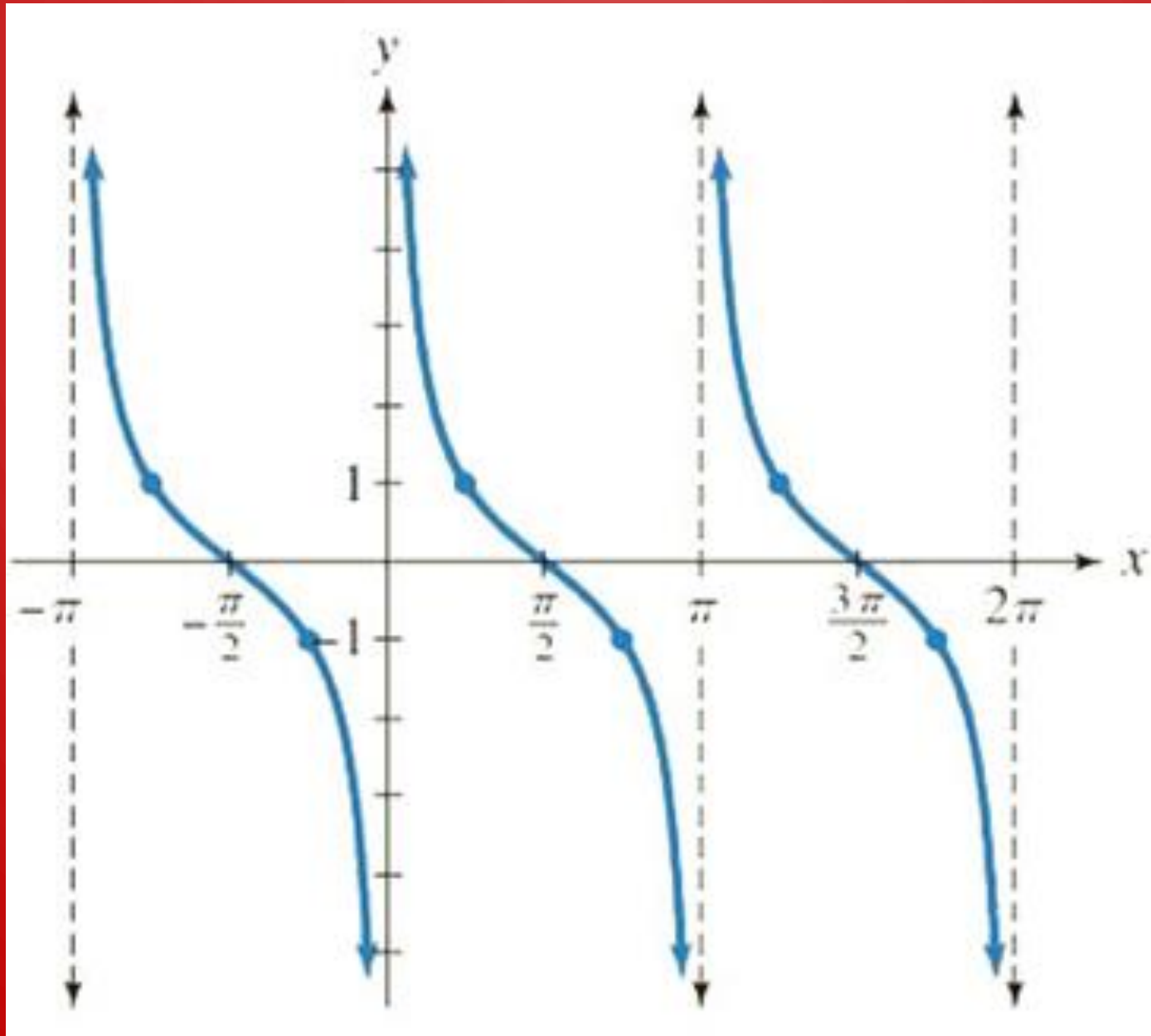
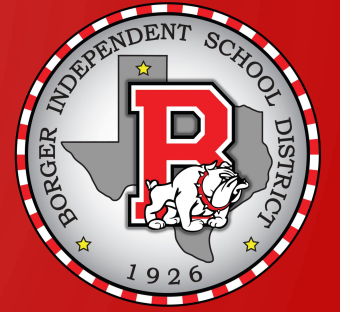
odd multiples of  $x = \frac{\pi}{2}$ .



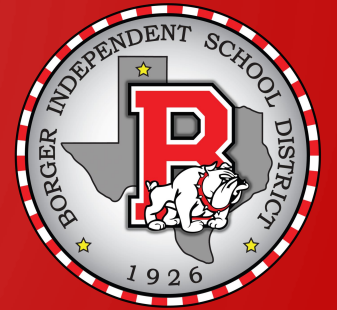
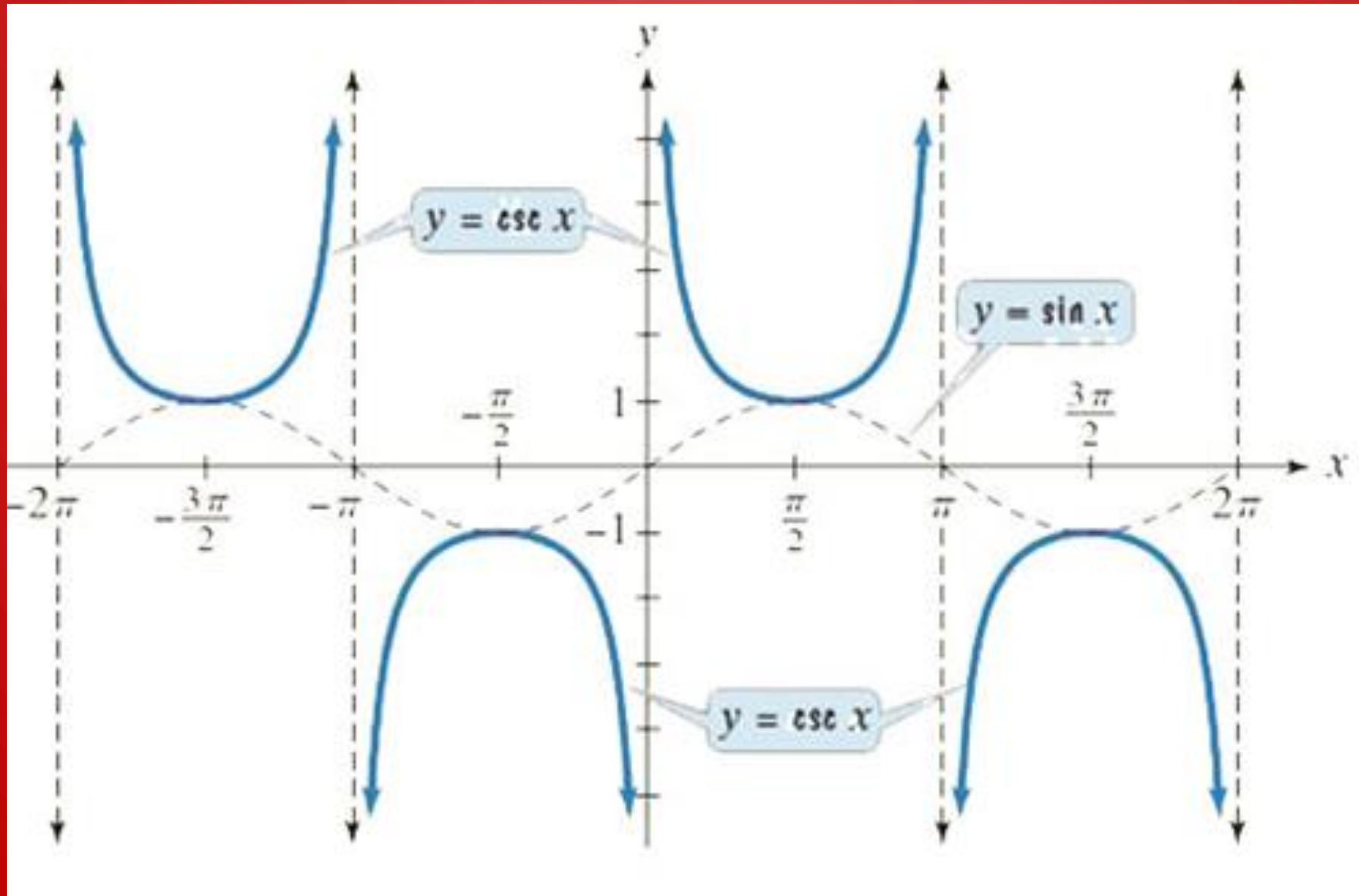
## Characteristics

- **Period:**  $\pi$
- **Domain:** All real numbers except odd multiples of  $\frac{\pi}{2}$
- **Range:** All real numbers
- **Vertical asymptotes** at odd multiples of  $\frac{\pi}{2}$
- **An x-intercept** occurs midway between each pair of consecutive asymptotes
- **Odd function** with origin symmetry
- Points on the graph  $\frac{1}{4}$  and  $\frac{3}{4}$  of the way between consecutive asymptotes have  $y$ -coordinates of  $-1$  and  $1$ , respectively.





- **Period:**  $\pi$
- **Domain:** All real numbers except integral multiples of  $\pi$
- **Range:** all real numbers
- **Vertical asymptotes** at integral multiples of  $\pi$
- **An x-intercept** occurs midway between each pair of consecutive asymptotes
- **Odd function** with origin symmetry
- Points on the graph  $\frac{1}{4}$  and  $\frac{3}{4}$  of the way between consecutive asymptotes have y-coordinates of 1 and -1, respectively.





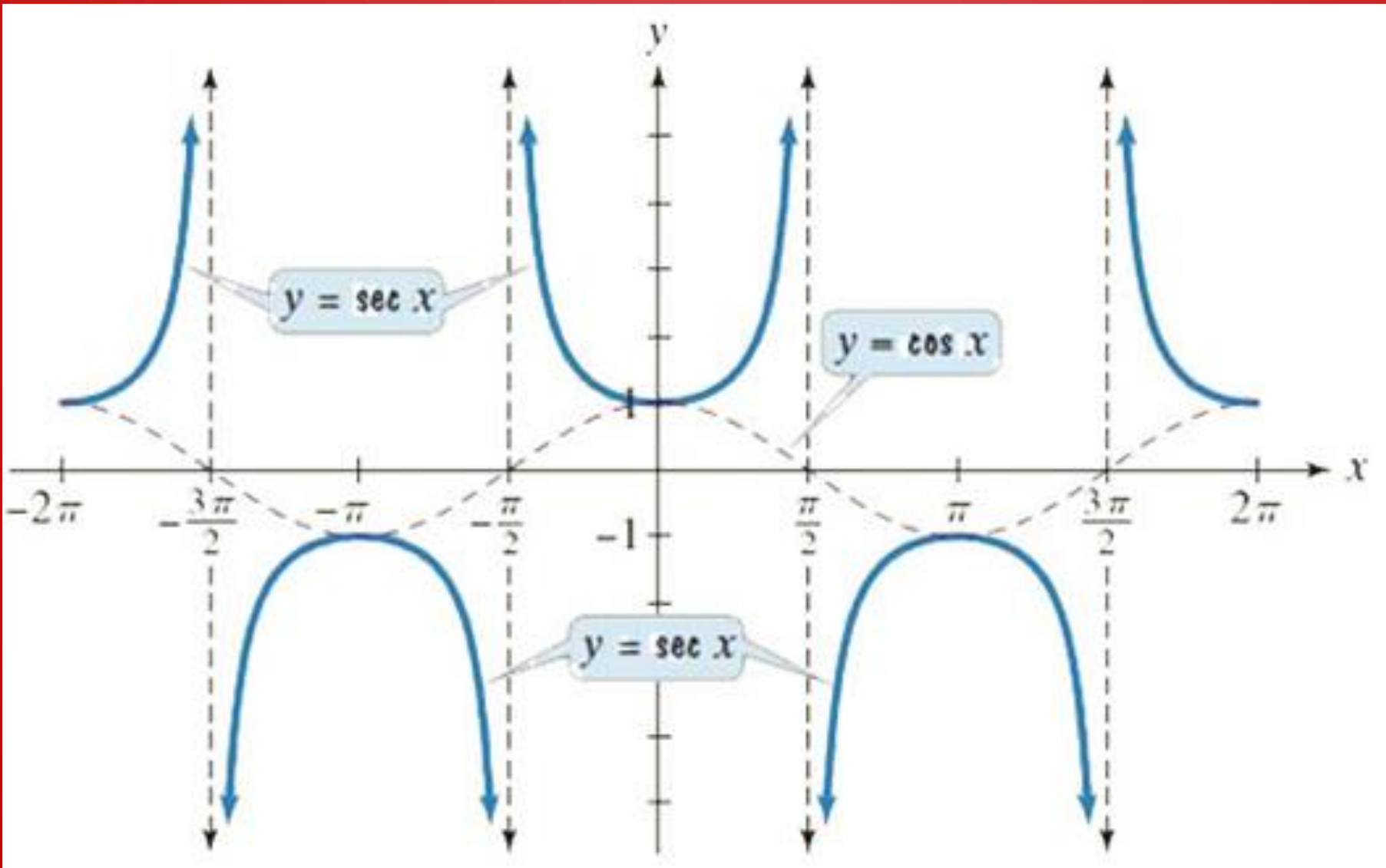
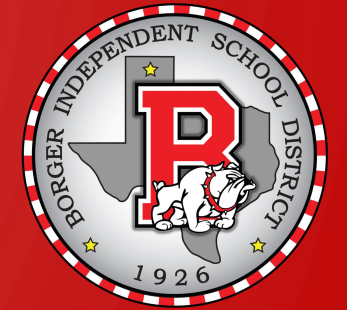
**Period:**  $2\pi$

**Domain:** All real numbers except integral multiples of  $\pi$

**Range:** All real numbers  $y$  such that  $y \leq -1$  or  $y \geq 1$ :  $(-\infty, -1] \cup [1, \infty)$

**Vertical asymptotes** at integral multiples of  $\pi$

**Odd functions**,  $\csc(-x) = -\csc x$ , with origin symmetry



- **Period:**  $2\pi$
- **Domain:** All real numbers except odd multiples of  $\frac{\pi}{2}$
- **Range:** All real numbers  $y$  such that  
 $y \leq -1$  or  $y \geq 1$ :  $(-\infty, -1] \cup [1, \infty)$
- **Vertical asymptotes** at odd multiples of  $\frac{\pi}{2}$
- **Even functions**,  $\sec(-x) = \sec x$ , with  $y$ -axis symmetry

$3\cot 2x$

$$D: x \neq k\frac{\pi}{2}$$

$$R: \mathbb{R}$$

$$T: \frac{\pi}{2}$$

$$1^{st} 2^{nd} \text{ Asy: } \frac{\pi}{2}, \pi$$

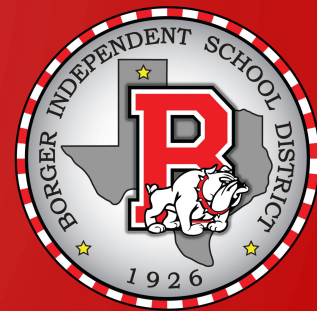
$\csc x$

$$T: 2\pi$$

$$D: x \neq k\pi$$

$$R: (-\infty, -1] \cup [1, \infty)$$

ODD



$$\csc\left(x + \frac{\pi}{4}\right)$$

$$T: 2\pi$$

$$D: x \neq \frac{3\pi}{4} + k\pi$$

$$R: (-\infty, -1] \cup [1, \infty)$$

$$1^{\text{st}} \ 2^{\text{nd}} \ \text{Asy: } \frac{3\pi}{4}, \frac{7\pi}{4}$$

$$\sec(x)$$

$$T = 2\pi$$

EVEN

$$D: x \neq \frac{\pi}{2} + k\pi$$

$$R: (-\infty, -1] \cup [1, \infty)$$

$$-3\sec\frac{x}{2} + 1$$

