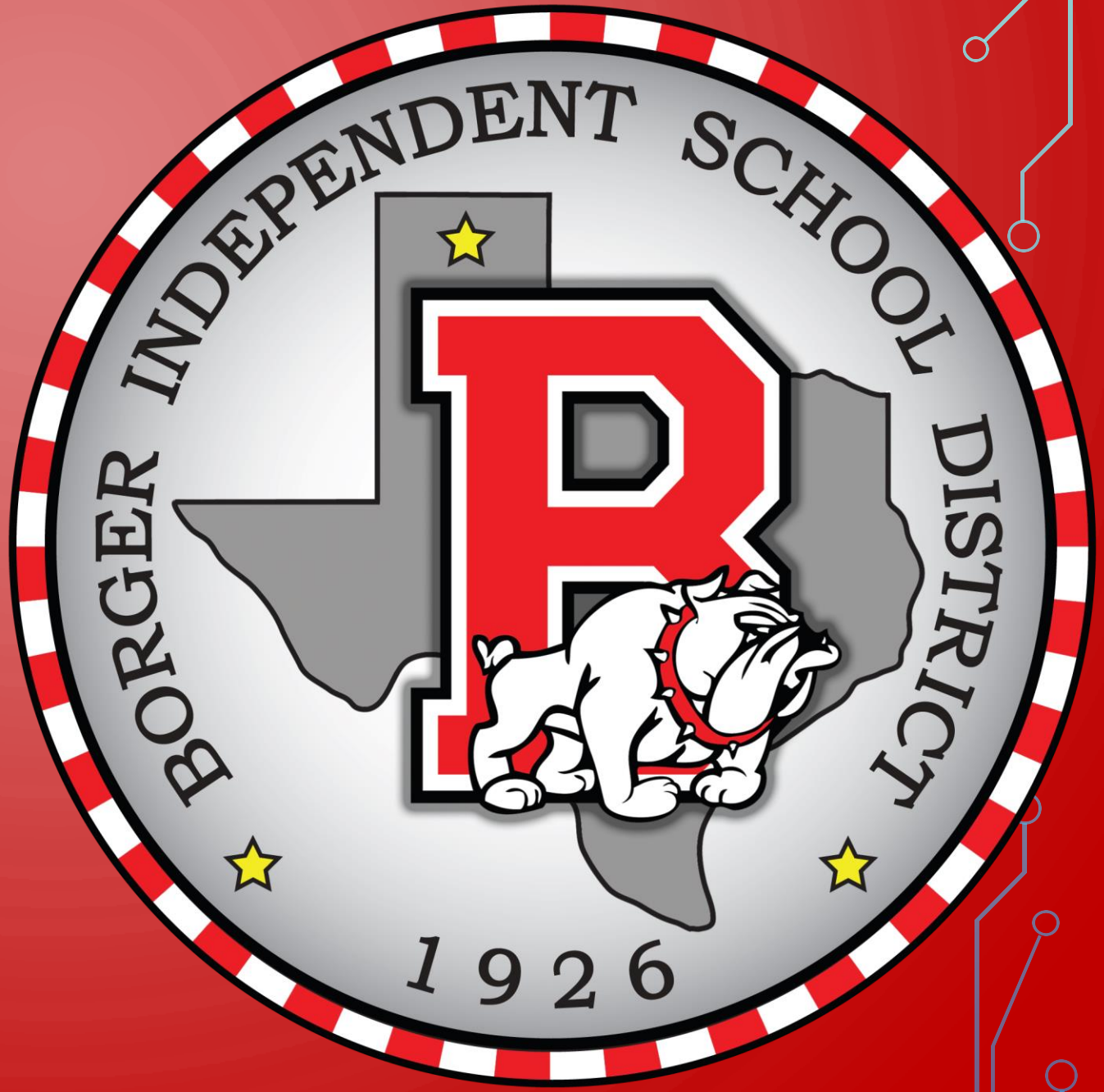
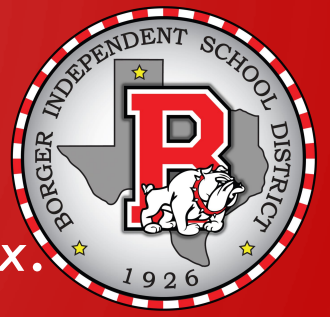
BOARD NOTES

12 FEBRUARY 2019



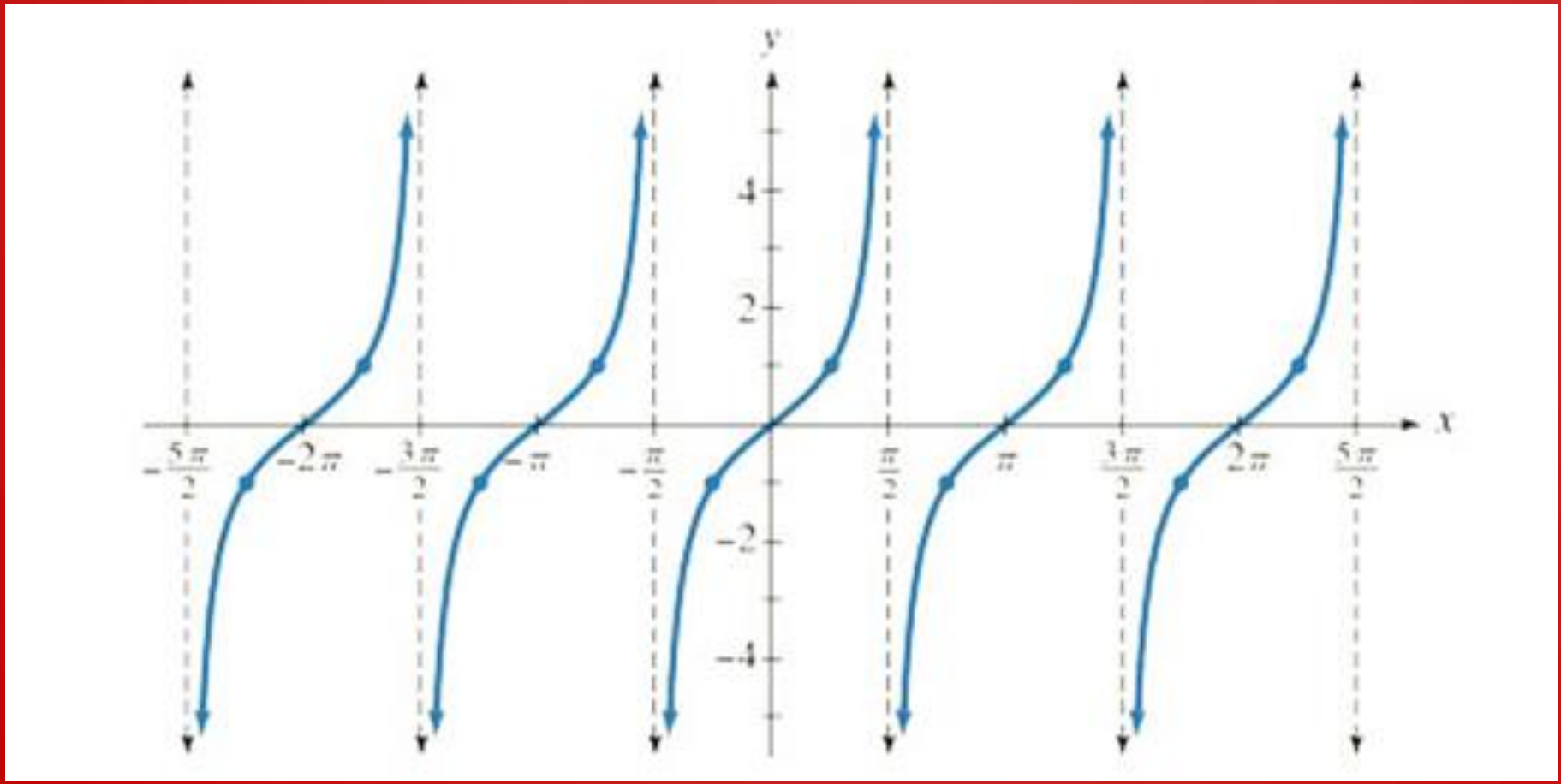
CC TRIGONOMETRY
CHAPTER 2 – GRAPHS OF THE TRIGONOMETRIC FUNCTIONS; INVERSE TRIGONOMETRIC FUNCTIONS



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 $y = \sec x$ & $y = \csc x$.


y
x
4
2
−2
−4
$-\frac{5\pi}{2}$
-2π
$-\frac{3\pi}{2}$
$-\pi$
$-\frac{\pi}{2}$
$\frac{\pi}{2}$
π
$\frac{3\pi}{2}$
2π
$\frac{5\pi}{2}$

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

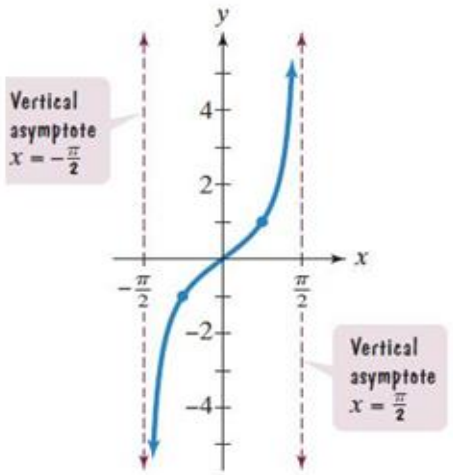
As x increases from 0 toward $\frac{\pi}{2}$, y increases slowly at first, then more and more rapidly.

Period: π

The tangent function is an odd function.

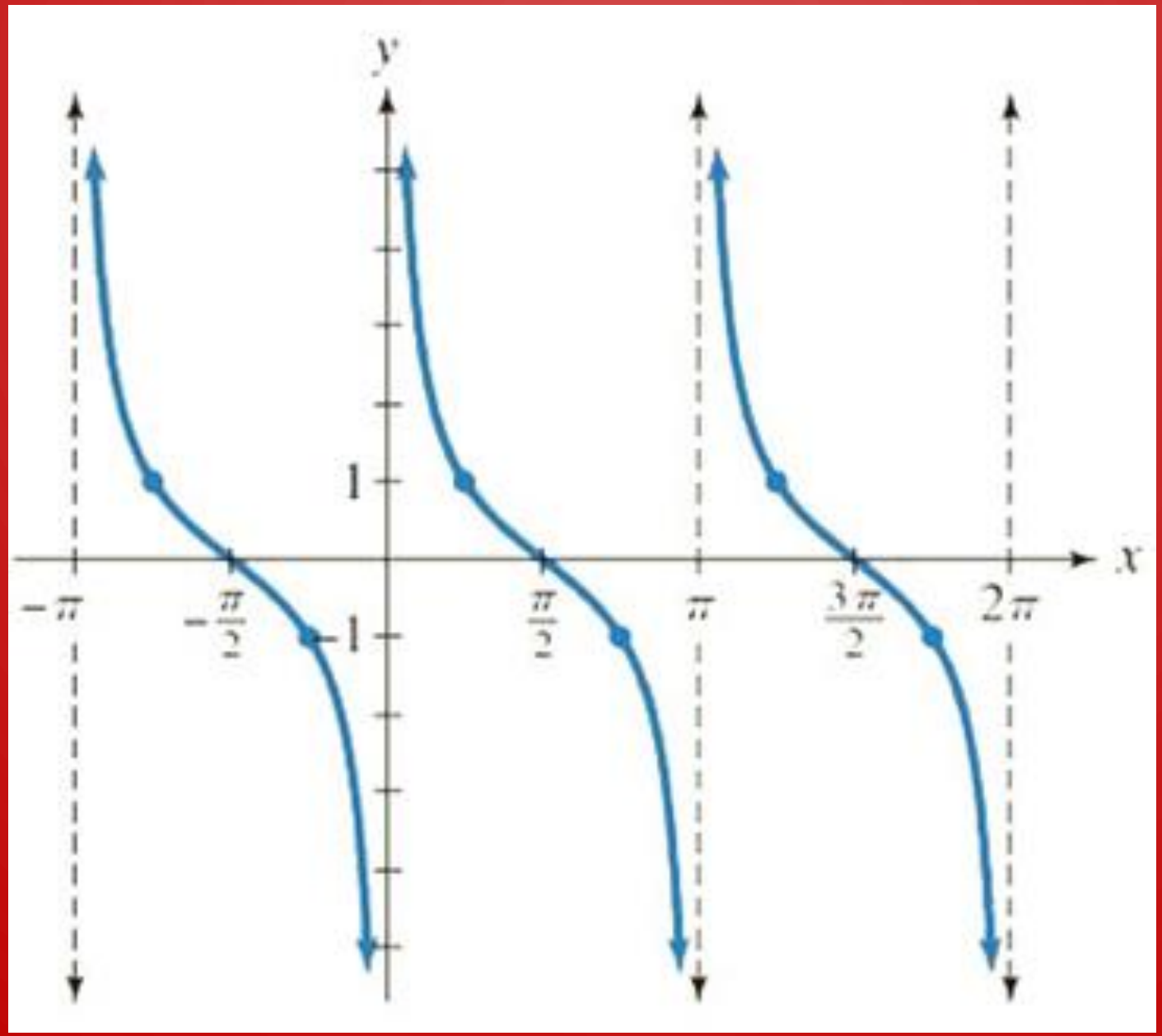
$$\tan(-x) = -\tan x$$

The tangent function is undefined at odd multiples of $x = \frac{\pi}{2}$.

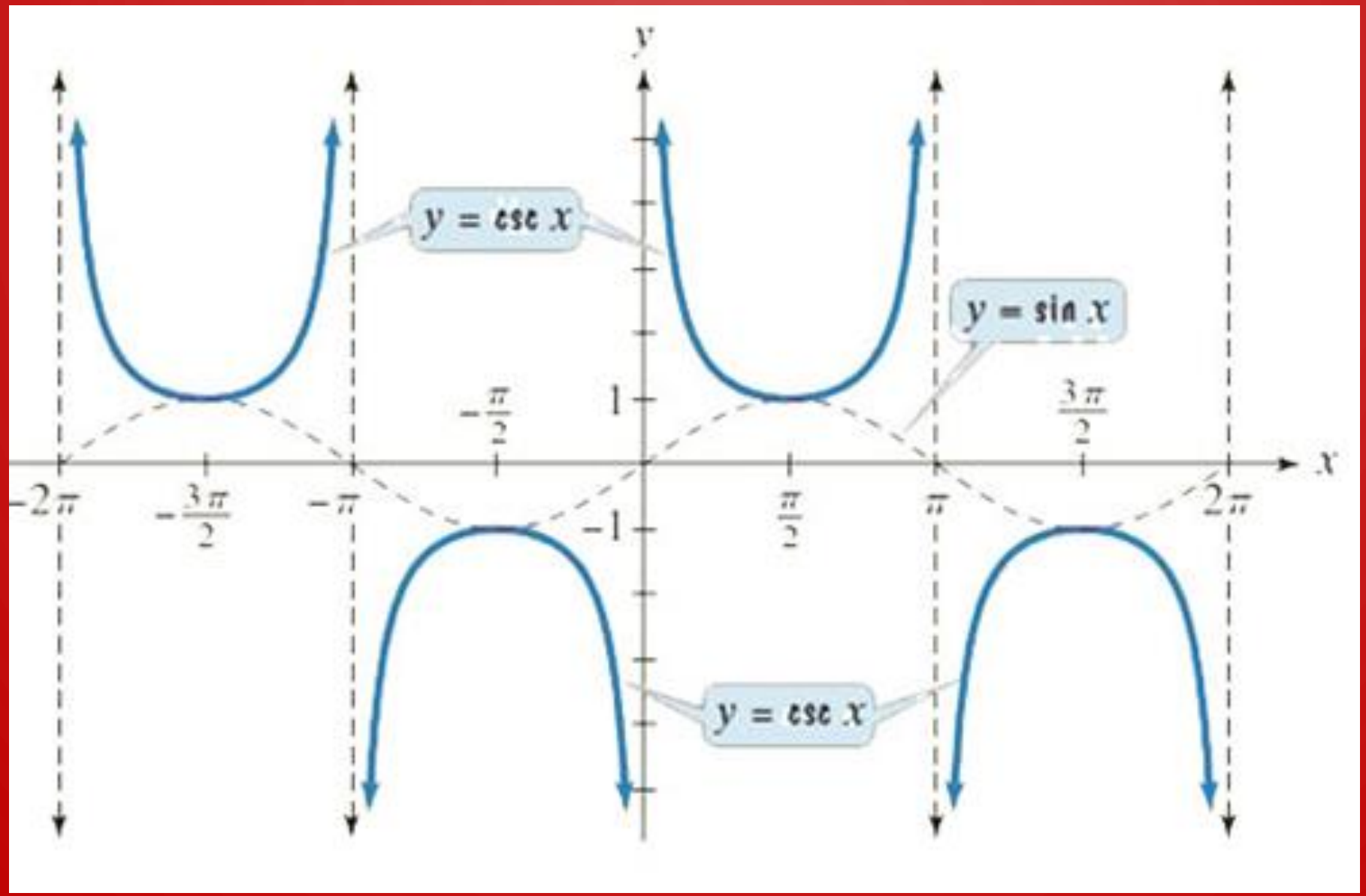


Characteristics

- **Period:** π
- **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.


y
x
1
−1
$-\pi$
$-\frac{\pi}{2}$
$\frac{\pi}{2}$
π
$\frac{3\pi}{2}$
2π

- **Period:** π
- **Domain:** All real numbers except integral multiples of π
- **Range:** all real numbers
- **Vertical asymptotes** at integral multiples of π
- **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.


y
x
y = csc x
y = sin x
y = csc x
1
−1
−2π
−3π/2
−π
−π/2
π/2
π
3π/2
2π

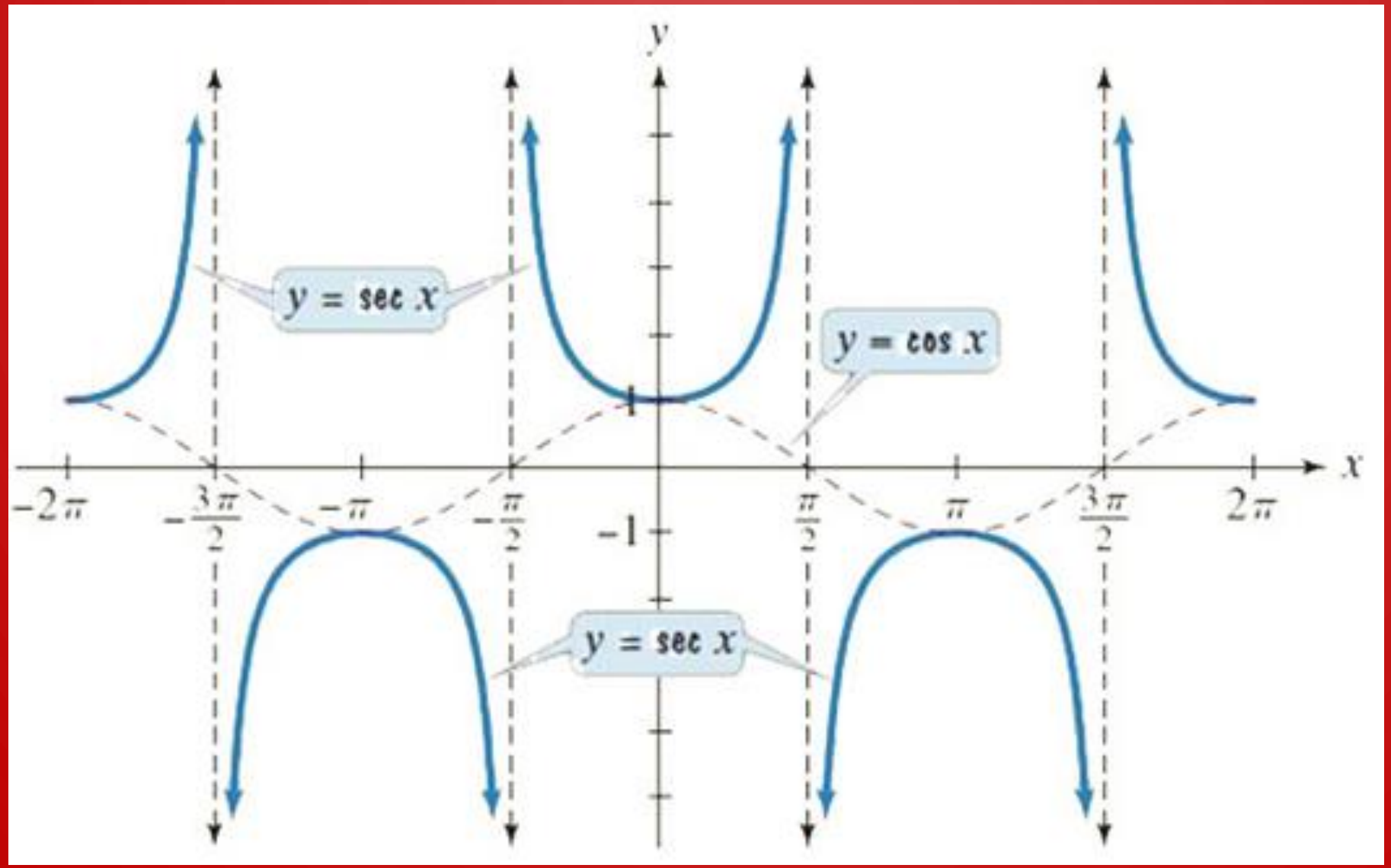
Period: 2π

Domain: All real numbers except integral multiples of π

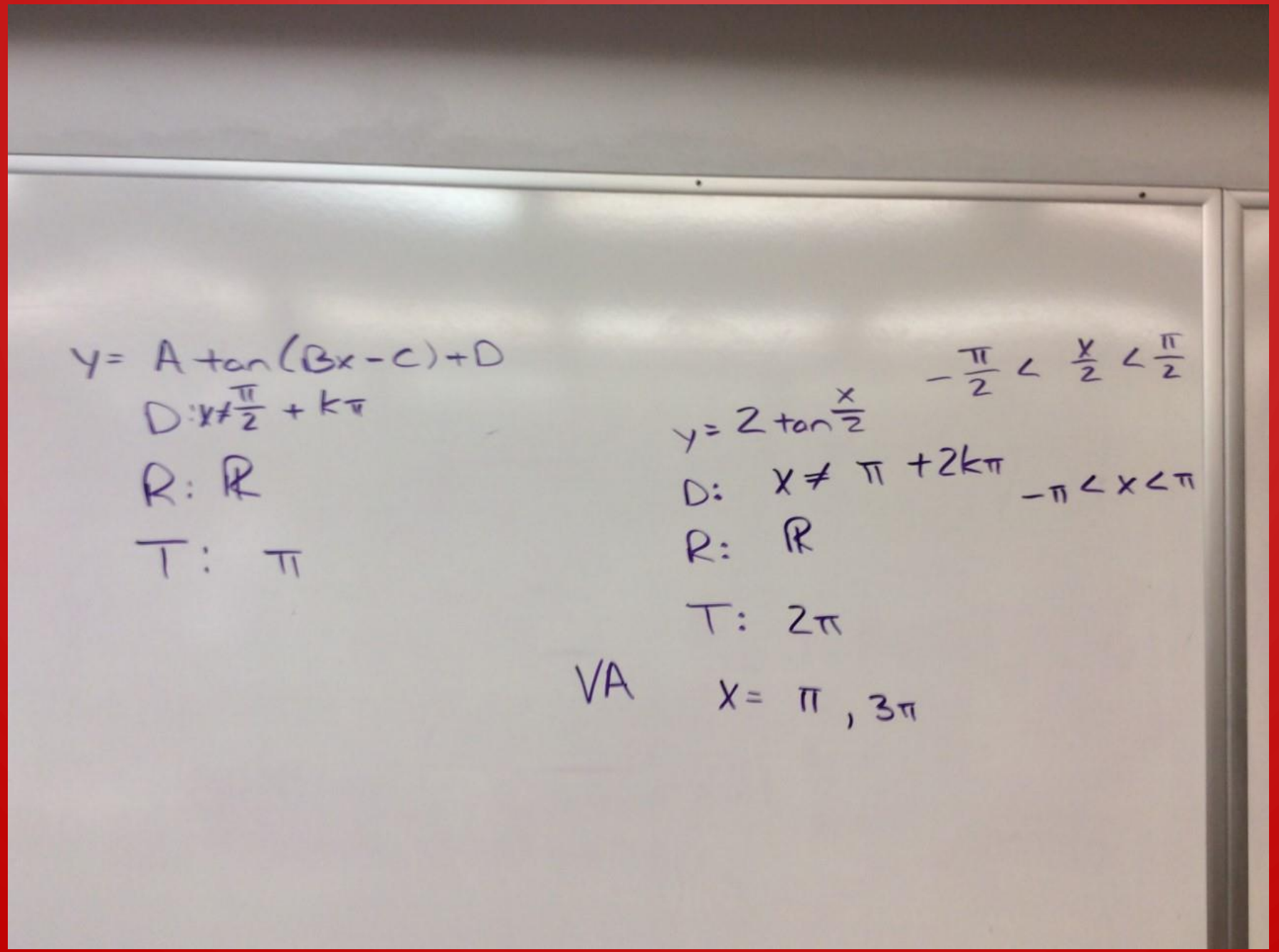
Range: All real numbers y such that $y \le -1$ or $y \ge 1$: $(-\infty, -1] \cup [1, \infty)$

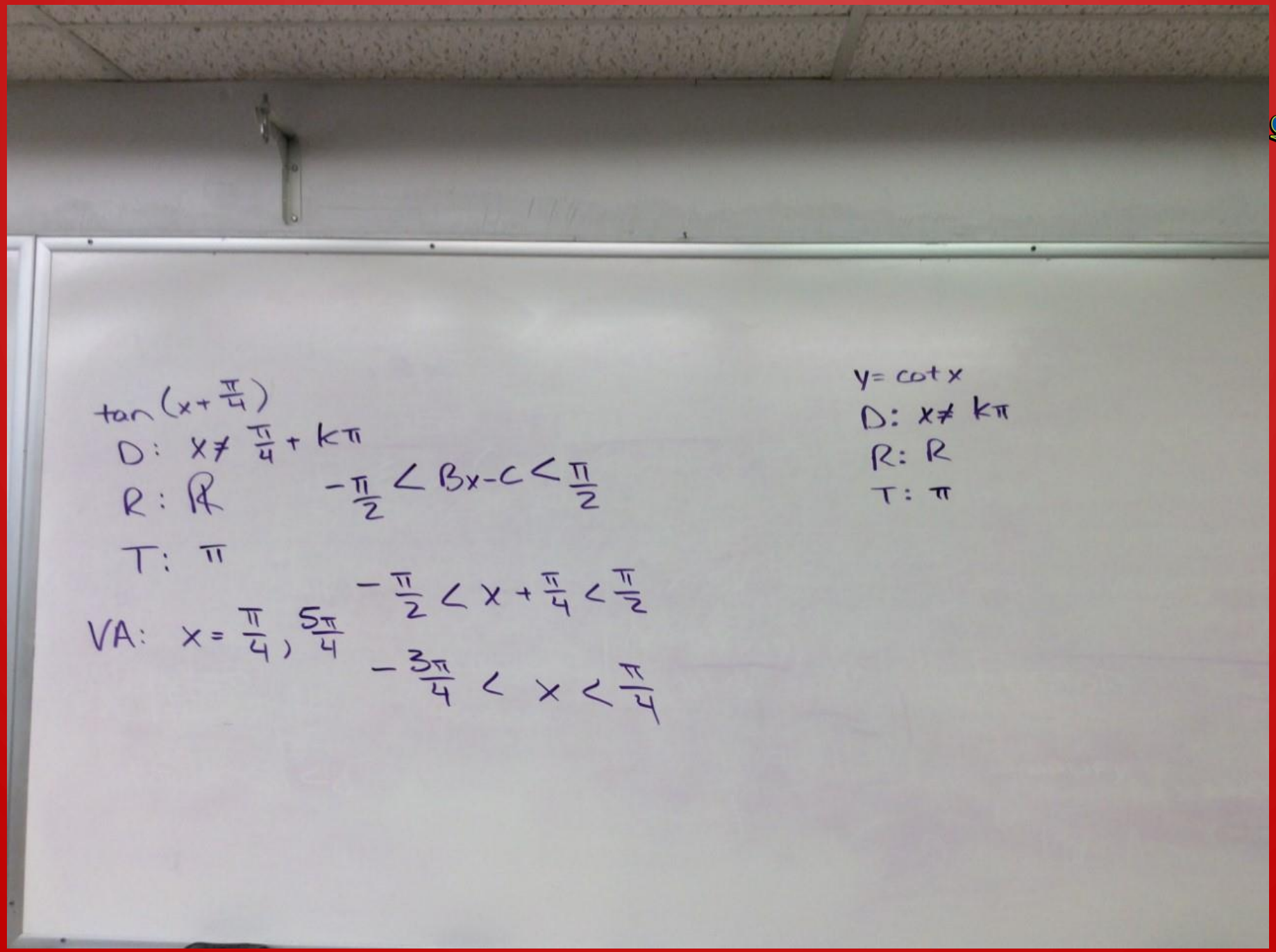
Vertical asymptotes at integral multiples of π

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


y
x
y = sec x
y = cos x
y = sec x
1
-1
-2π
$-\frac{3\pi}{2}$
$-\pi$
$-\frac{\pi}{2}$
$\frac{\pi}{2}$
π
$\frac{3\pi}{2}$
2π

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


y = A tan(Bx − C) + D
D: x ≠ π/2 + kπ
R: ℝ
T: π
y = 2 tan x/2
D: x ≠ π + 2kπ
R: ℝ
T: 2π
VA x = π, 3π
−π/2 < x/2 < π/2
−π < x < π


tan(x + π/4)
D: x ≠ π/4 + kπ
R: ℝ
T: π
VA: x = π/4, 5π/4
-π/2 < Bx - C < π/2
-π/2 < x + π/4 < π/2
-3π/4 < x < π/4
y = cot x
D: x ≠ kπ
R: R
T: π