

### Trig Graphing Practice

For each problem, find the amplitude, period, units, phase shift, vertical shift, and/or asymptotes.

1.  $y = 5\cos(2x - \pi) - 1$

2.  $y = 2\sec(1/3x) + 1$

3.  $y = \sin(4x - \pi) + 1$

4.  $y = \csc(2x - \pi) - 2$

5.  $y = -\tan\left(\frac{1}{2}x + \pi\right) - 1$

6.  $y = \cot(3x + \pi) + 2$

7.  $y = 5\sin(x - \pi) + 2$

8.  $f(x) = 4\csc\left(x + \frac{\pi}{2}\right) - 1$

9.  $f(x) = 5\cos(4x + \pi) + 1$

10.  $f(x) = 5\sec\left(\frac{1}{4}x - \frac{\pi}{2}\right)$

11.  $y = \tan(3x - \pi)$

12.  $y = \cot\left(x - \frac{\pi}{2}\right) + 1$

Key:

$$1) y = 5\cos(2x - \pi) - 1$$

Amp: 5

$$Pd = \frac{2\pi}{|b|} = \frac{2\pi}{|2|} = \pi$$

$$\text{Unit} = \frac{Pd}{4} = \frac{\pi}{4}$$

Phase Shift:

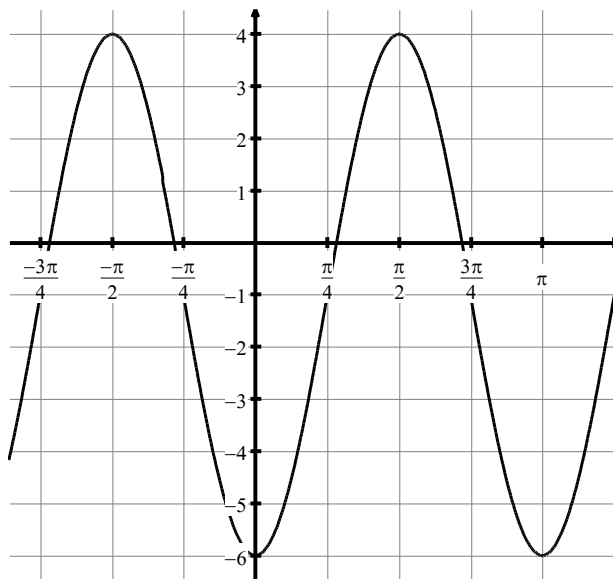
$$2x - \pi = 0$$

$$x = \frac{\pi}{2}$$

VS = -1 (down 1)

Domain: All real numbers

Range: [-6, 4]



$$2) y = 2\sec(1/3x) + 1$$

“Amp”: 2

$$Pd = \frac{2\pi}{|b|} = \frac{2\pi}{|1/3|} = 6\pi$$

$$\text{Unit} = \frac{Pd}{4} = \frac{6\pi}{4} = \frac{3\pi}{2}$$

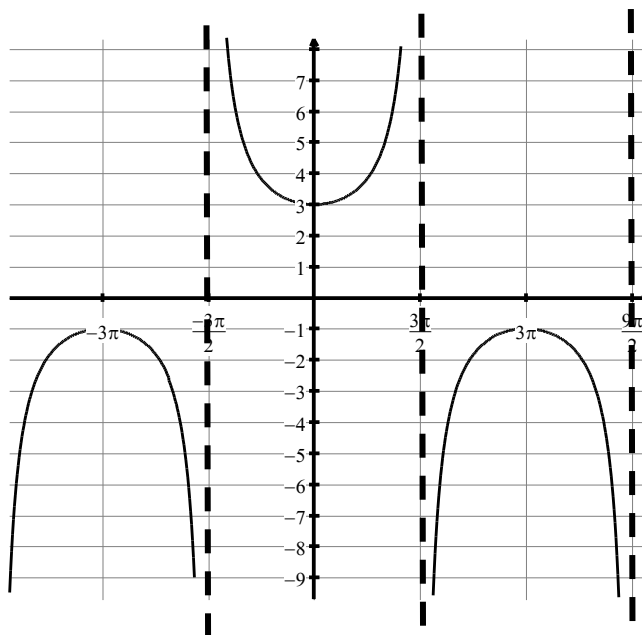
Phase Shift: none

VS = up 1

Domain: All real numbers except odd multiples of  $3\pi/2$ .

$$\left\{ x \in \mathbb{R} : x \neq (2k+1)\frac{3\pi}{2}, k \in \mathbb{Z} \right\}$$

Range:  $(-\infty, -1] \cup [3, \infty)$



3)  $y = \sin(4x - \pi) + 1$

Amp: 2

$$Pd = \frac{2\pi}{|b|} = \frac{2\pi}{|4|} = \frac{\pi}{2}$$

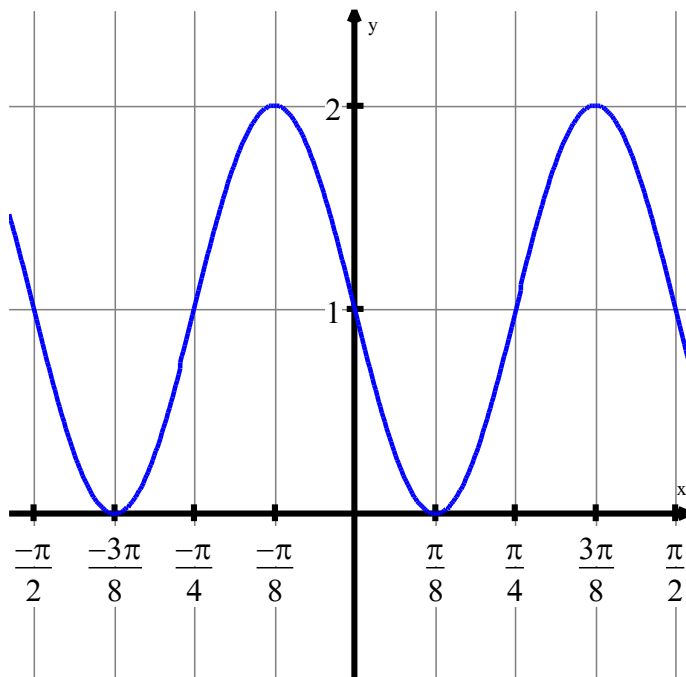
$$\text{Unit} = \frac{Pd}{4} = \left(\frac{\pi}{2}\right)\left(\frac{1}{4}\right) = \frac{\pi}{8}$$

Phase Shift:  $\pi/8$

VS = up 1

Domain: All real numbers

Range:  $[0, 2]$



4)  $y = \csc(2x - \pi) - 2$

“Amp”: 1

$$Pd = \frac{2\pi}{|b|} = \frac{2\pi}{|2|} = \pi$$

$$\text{Unit} = \frac{Pd}{4} = \frac{\pi}{4}$$

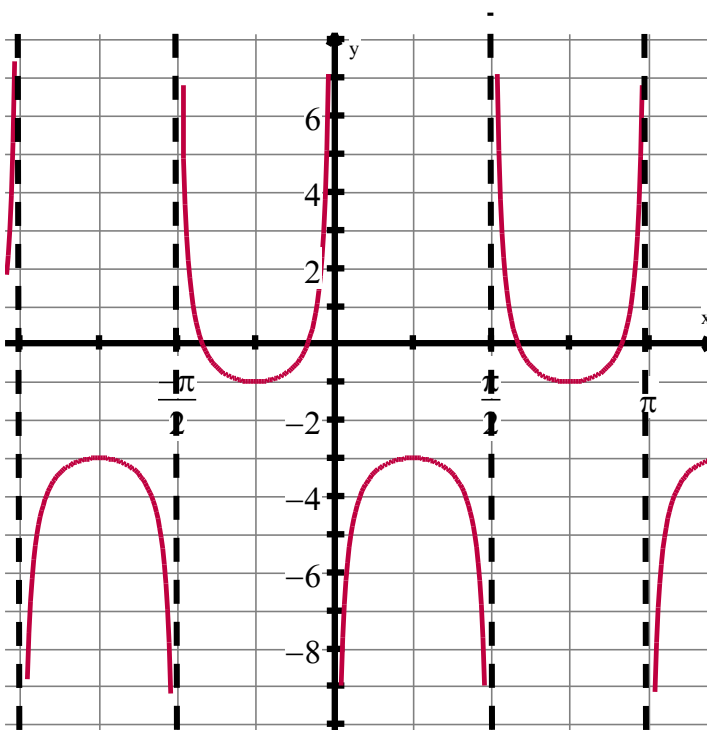
Phase Shift:  $\pi/2$  right

VS = down 2

Domain: All real numbers except multiples of  $\pi/2$ .

$$\left\{x \in \mathbb{R} : x \neq \frac{k\pi}{2}, k \in \mathbb{Z}\right\}$$

Range:  $(-\infty, -3] \cup [-1, \infty)$



$$5) y = -\tan\left(\frac{1}{2}x + \pi\right) - 1$$

$$Pd = \frac{\pi}{|b|} = \frac{\pi}{1/2} = 2\pi$$

$$\text{Unit} = \frac{Pd}{2} = \frac{2\pi}{2} = \pi$$

Asymptotes:

$$\frac{1}{2}x + \pi = -\frac{\pi}{2} \quad \frac{1}{2}x + \pi = \frac{\pi}{2}$$

$$x = -3\pi \quad x = -\pi$$

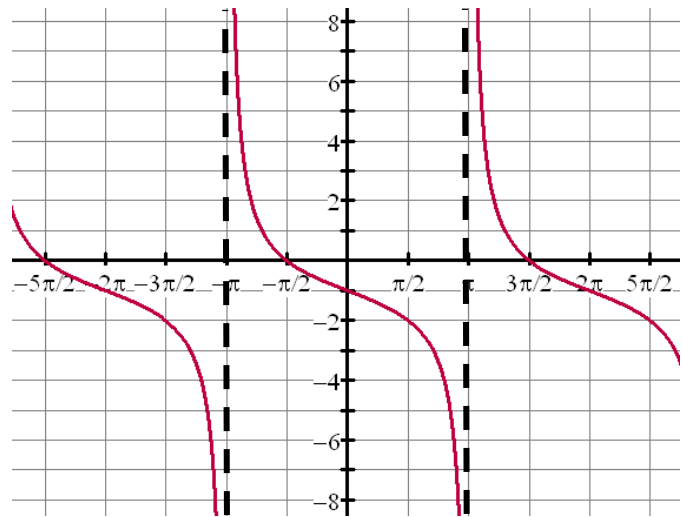
The asymptotes are  $2\pi$  apart, so other asymptotes would be at  $\pi, 3\pi, 5\pi$ , etc.

VS = -1 (down 1)

Domain: All real numbers except odd multiples of  $\pi$

$$\{x \in \mathbb{R} : x \neq (2k+1)\pi, k \in \mathbb{Z}\}$$

Range: All real numbers



$$6) y = \cot(3x + \pi) + 2$$

$$Pd = \frac{\pi}{|b|} = \frac{\pi}{3}$$

$$\text{Unit} = \frac{Pd}{4} = \left(\frac{1}{4}\right)\left(\frac{\pi}{3}\right) = \frac{\pi}{12}$$

Asymptotes:

$$3x + \pi = 0 \quad 3x + \pi = \pi$$

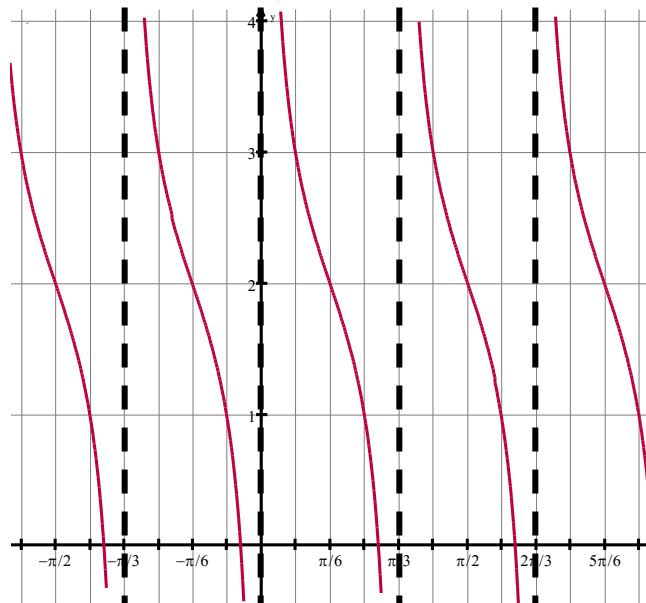
$$x = \frac{-\pi}{3} \quad x = 0$$

VS = up 2

Domain: All real numbers except multiples of  $\pi/3$

$$\left\{x \in \mathbb{R} : x \neq \frac{k\pi}{3}, k \in \mathbb{Z}\right\}$$

Range: All real numbers



7)  $y = 5\sin(x - \pi) + 2$

Amp = 5

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

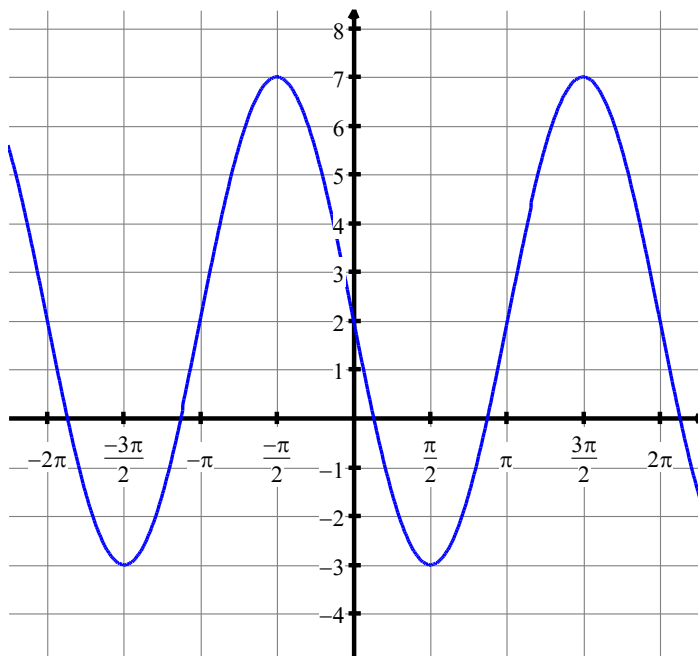
$$\text{Unit} = \frac{Pd}{4} = \frac{2\pi}{4} = \frac{\pi}{2}$$

Phase Shift:  $x = \pi$  (right  $\pi$ )

VS = 2 (up 2)

Domain: All real numbers

Range:  $[-3, 7]$



8.  $f(x) = 4 \csc\left(x + \frac{\pi}{2}\right) - 1$

Amplitude = 4

Period =  $2\pi$

$$\text{Unit} = \frac{\pi}{2}$$

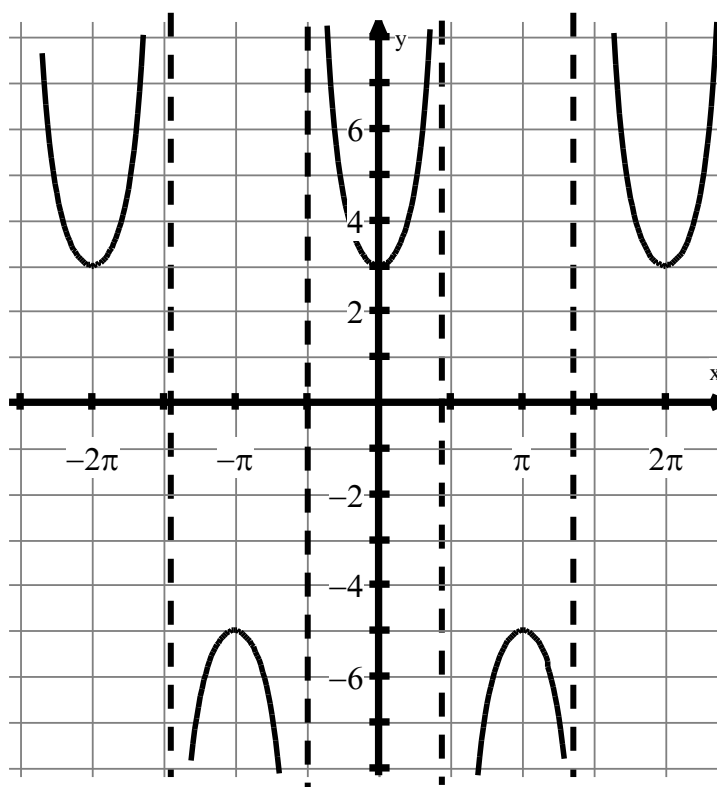
$$PS = -\frac{\pi}{2} \text{ or } \frac{\pi}{2} \text{ left}$$

VS = down 1

Domain: All real numbers  
except odd multiples of  $\pi/2$

$$\left\{x \in \mathbb{R} : x \neq (2k+1)\frac{\pi}{2}, k \in \mathbb{Z}\right\}$$

Range:  $(-\infty, -5] \cup [3, \infty)$



9.  $f(x) = 5 \cos(4x + \pi) + 1$

Amp = 5

$$Pd = \frac{2\pi}{|b|} = \frac{2\pi}{|4|} = \frac{\pi}{2}$$

$$\text{Unit} = \frac{Pd}{4} = \left(\frac{1}{4}\right)\left(\frac{\pi}{2}\right) = \frac{\pi}{8}$$

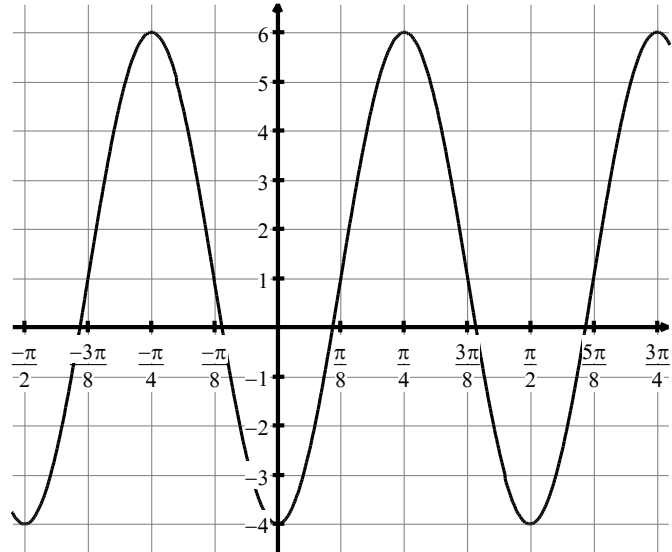
Phase Shift:  $4x + \pi = 0$

$$x = \frac{-\pi}{4}; \frac{\pi}{4} \text{ left}$$

VS = up 1

Domain: All real numbers

Range:  $[-4, 6]$



10)  $y = 5 \sec\left(\frac{1}{4}x - \frac{\pi}{2}\right)$

Amplitude = 5

Period =  $8\pi$

Unit =  $2\pi$

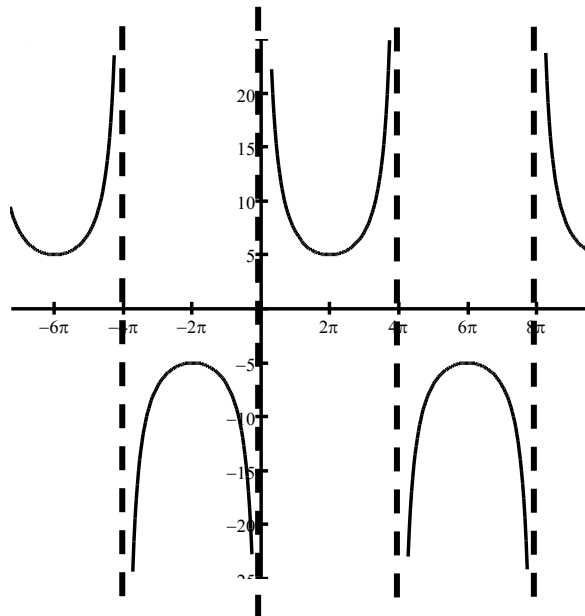
PS =  $2\pi$  right

VS = none

Domain: All real numbers  
except multiples of  $4\pi$

$$\{x \in R : x \neq 4k\pi, k \in Z\}$$

Range:  $(-\infty, -5] \cup [5, \infty)$



$$11) y = \tan(3x - \pi)$$

$$Pd = \frac{\pi}{|b|} = \frac{\pi}{3}$$

$$\text{Unit} = \frac{Pd}{2} = \left(\frac{1}{2}\right)\left(\frac{\pi}{3}\right) = \frac{\pi}{6}$$

Asymptotes:

$$3x - \pi = -\frac{\pi}{2} \qquad 3x - \pi = \frac{\pi}{2}$$

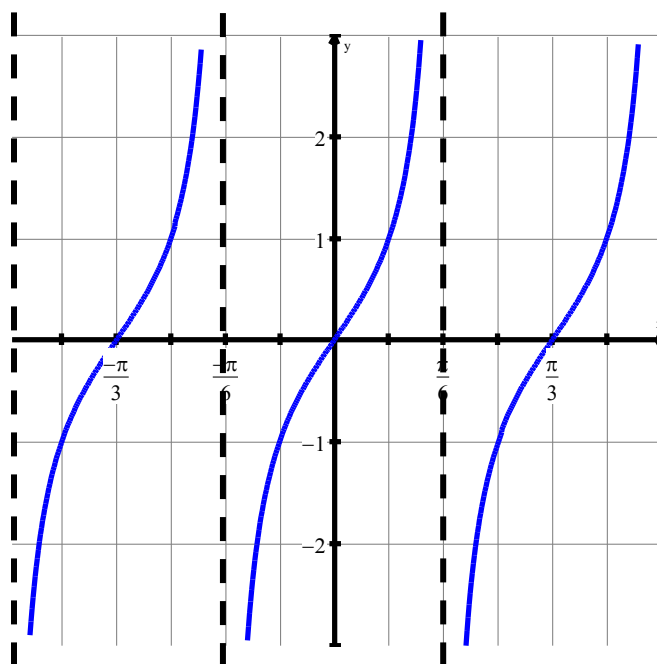
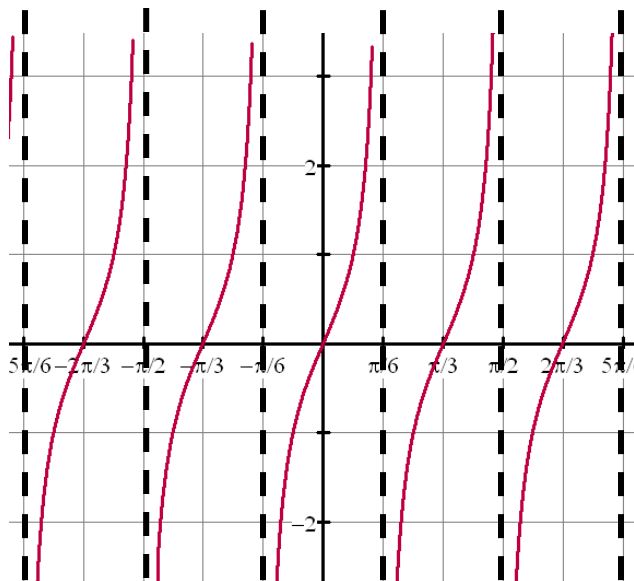
$$3x = \frac{\pi}{2} \qquad 3x = \frac{3\pi}{2}$$

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

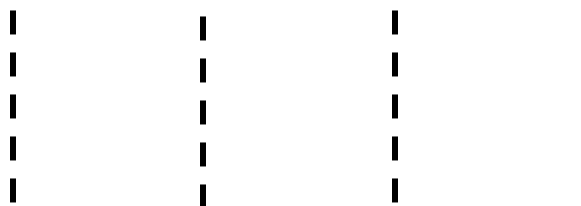
Domain: All real numbers except odd multiples of  $\pi/6$

$$\left\{ x \in \mathbb{R} : x \neq (2k+1)\frac{\pi}{6}, k \in \mathbb{Z} \right\}$$

Range: All real numbers



Same graph using units of  $\pi/12$ .



$$12) y = \cot\left(x - \frac{\pi}{2}\right) + 1$$

$$Pd = \frac{\pi}{|b|} = \frac{\pi}{1} = \pi$$

$$\text{Unit} = \frac{Pd}{4} = \frac{\pi}{4}$$

Asymptotes:

$$x - \frac{\pi}{2} = 0$$

$$x = \frac{\pi}{2}$$

$$x - \frac{\pi}{2} = \pi$$

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

VS: Up 1

Domain: All real numbers except odd multiples of  $\pi/2$

$$\left\{x \in \mathbb{R} : x \neq (2k+1)\frac{\pi}{2}, k \in \mathbb{Z}\right\}$$

Range: All real numbers

