

## Section 7.5. Graphs of other trigonometric functions

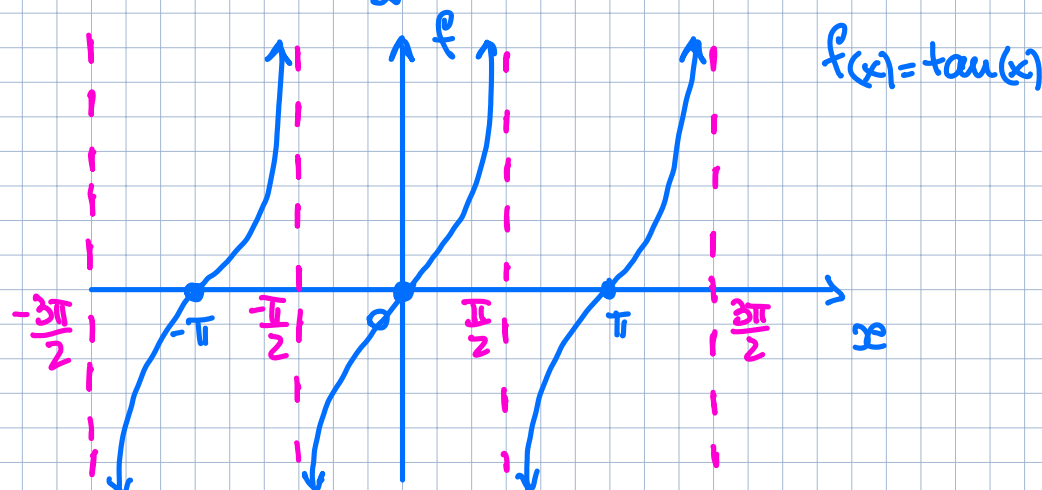
1. Graphing tangent and cotangent functions.
2. Graphing secant and cosecant functions.

1.

$$f(x) = \tan(x) = \frac{\sin(x)}{\cos(x)}$$

$$g(x) = \cot(x) = \frac{\cos(x)}{\sin(x)}$$

- $f(x) = \tan(x)$   
 $\cos(x) \neq 0 \Rightarrow x \neq \frac{\pi}{2} + \pi n, n \in \mathbb{Z}$



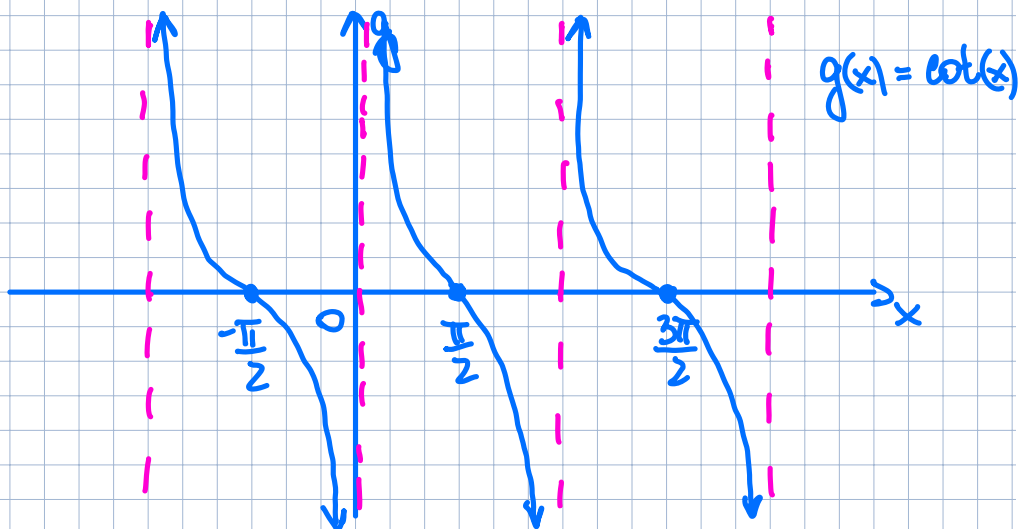
Note:

$$\text{Dom}(f) = \left\{ x \mid x \neq \frac{\pi}{2} + \pi n, n \in \mathbb{Z} \right\}$$

$$\text{Ran}(f) = \mathbb{R}$$

- $g(x) = \cot(x) = \frac{\cos(x)}{\sin(x)}$

$$\sin(x) \neq 0 \Rightarrow x \neq \pi n, n \in \mathbb{Z}$$



Note:

$$\text{Dom}(g) = \left\{ x \mid x \neq \pi n, n \in \mathbb{Z} \right\}$$

$$\text{Ran}(g) = \mathbb{R}$$

2.

Cosecant function

$$f(x) = \csc(x) = \frac{1}{\sin(x)}$$

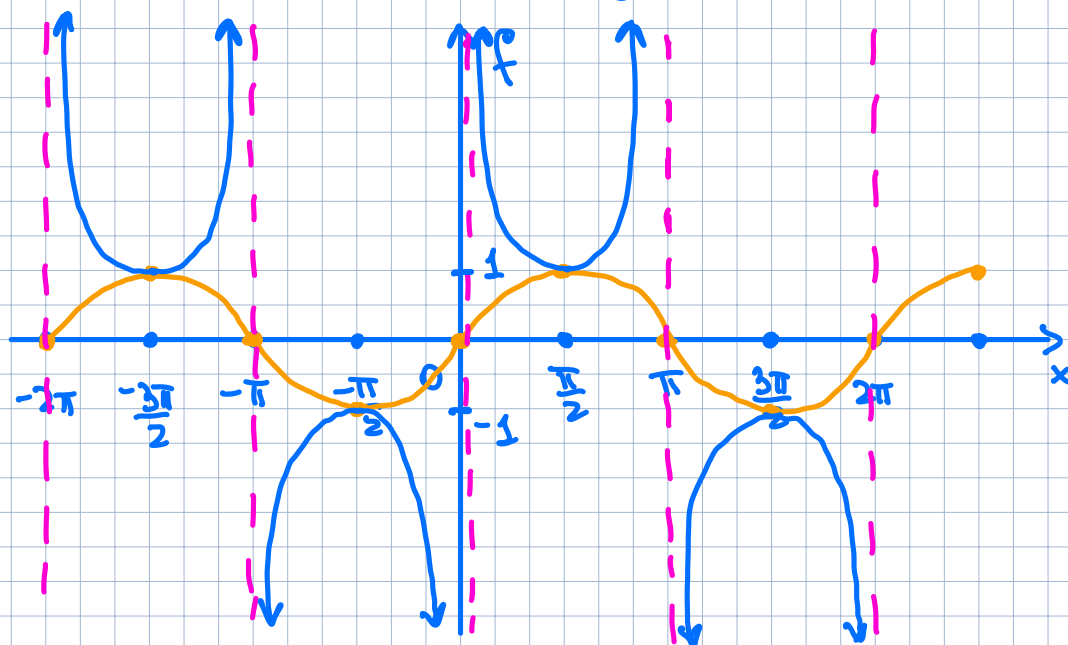
1.  $\text{Dom}(f) = \{x \mid \sin(x) \neq 0, x \neq \pi n, n \in \mathbb{Z}\}$ .

2.  $f(-x) = -f(x)$  - odd function

3.  $f(x+2\pi) = f(x)$  -  $2\pi$ -periodic

4.  $-1 \leq \sin(x) \leq 1 \Rightarrow +1 \leq \csc(x) \leq -1$

5.  $f = \csc(x)$  is symmetric with respect to  $y = \pm \frac{\pi}{2}, y = \pm \frac{3\pi}{2}$



$\text{Ran}(f) = (-\infty; -1] \cup [1, \infty)$

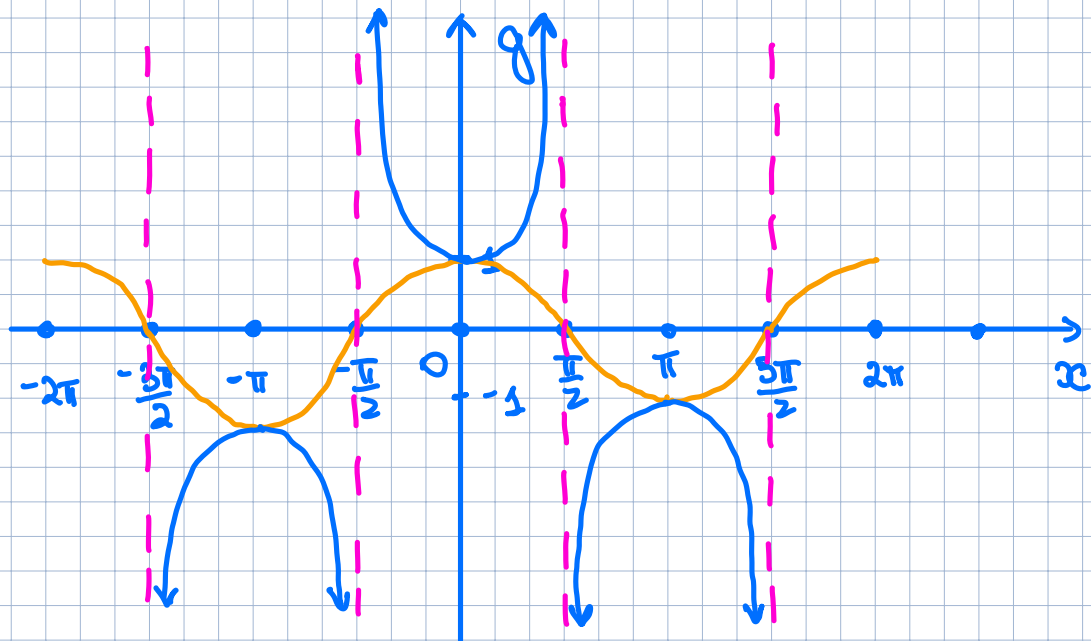
Secant function  $g(x) = \sec(x) = \frac{1}{\cos(x)}$

1.  $\text{Dom}(g) = \{x \mid \cos(x) \neq 0, x \neq \frac{\pi}{2} + \pi n, n \in \mathbb{Z}\}$

2.  $g(-x) = g(x)$  - even function

3.  $g(x+2\pi) = g(x)$  -  $2\pi$ -periodic

4.  $1 \leq \sec(x) \leq -1$



5.  $g(x)$  is symmetric with respect to  
 $x = \pm \pi n, n \in \mathbb{Z}$ .