

## 6.2) Graphs of $\sec x$ , $\operatorname{cosec} x$ and $\cot x$



## Worked example

Sketch the graph in the interval  $-2\pi \leq x \leq 2\pi$ :

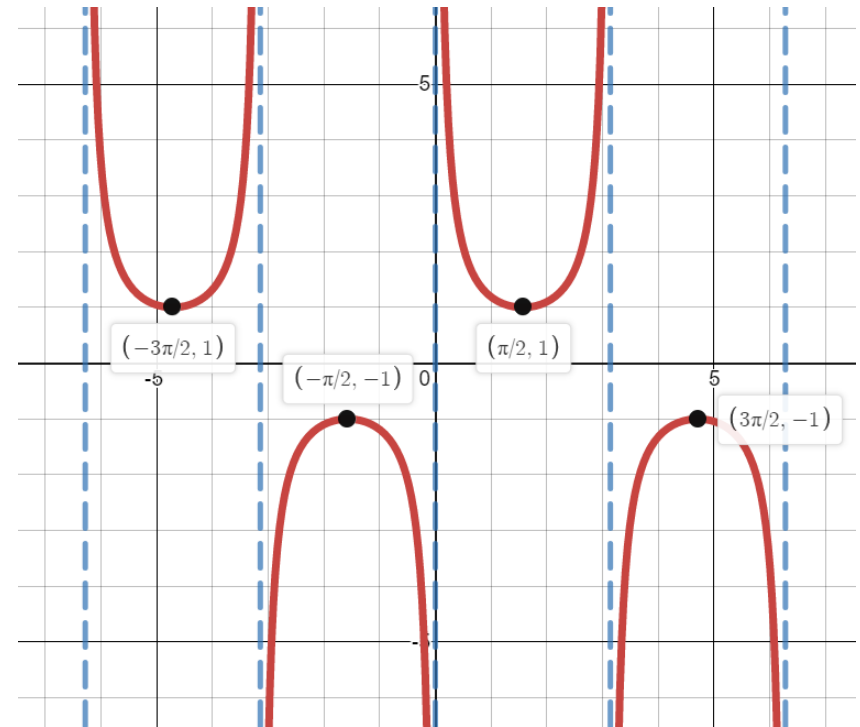
$$y = \operatorname{cosec}\left(x + \frac{\pi}{4}\right)$$

$$y = \cot\left(x - \frac{\pi}{3}\right)$$

## Your turn

Sketch the graph in the interval  $-2\pi \leq x \leq 2\pi$ :

$$y = \sec\left(x + \frac{\pi}{2}\right)$$



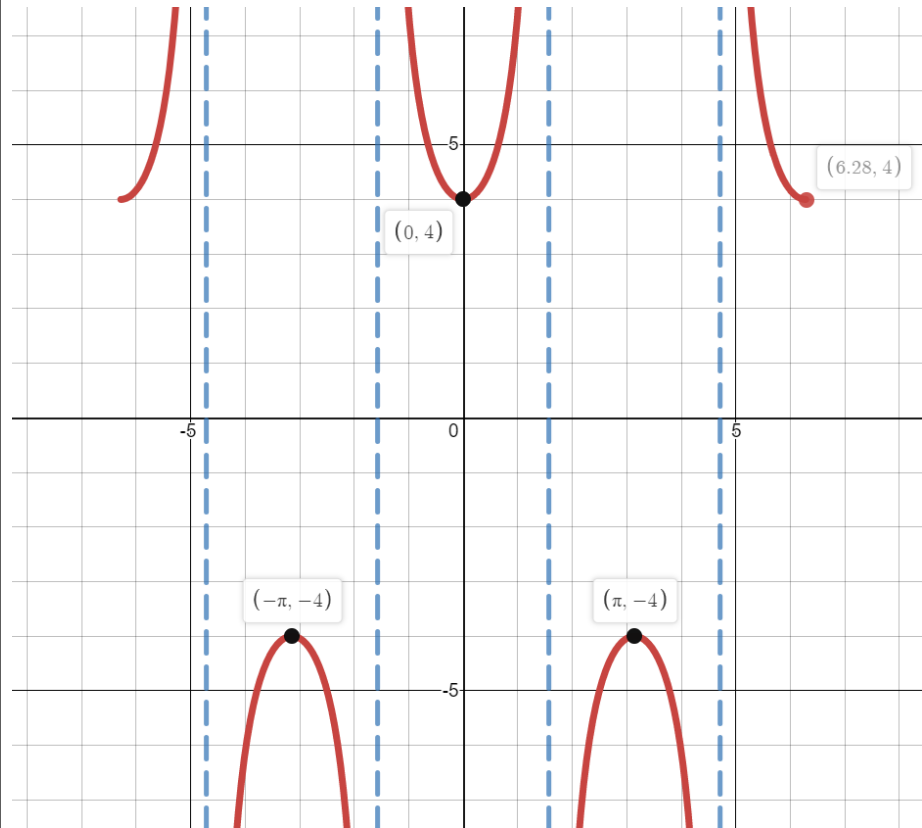
## Worked example

Sketch the graph in the interval  $-2\pi \leq x \leq 2\pi$ :  
 $y = 2\operatorname{cosec} x$

$$y = 3\cot x$$

## Your turn

Sketch the graph in the interval  $-2\pi \leq x \leq 2\pi$ :  
 $y = 4\sec x$



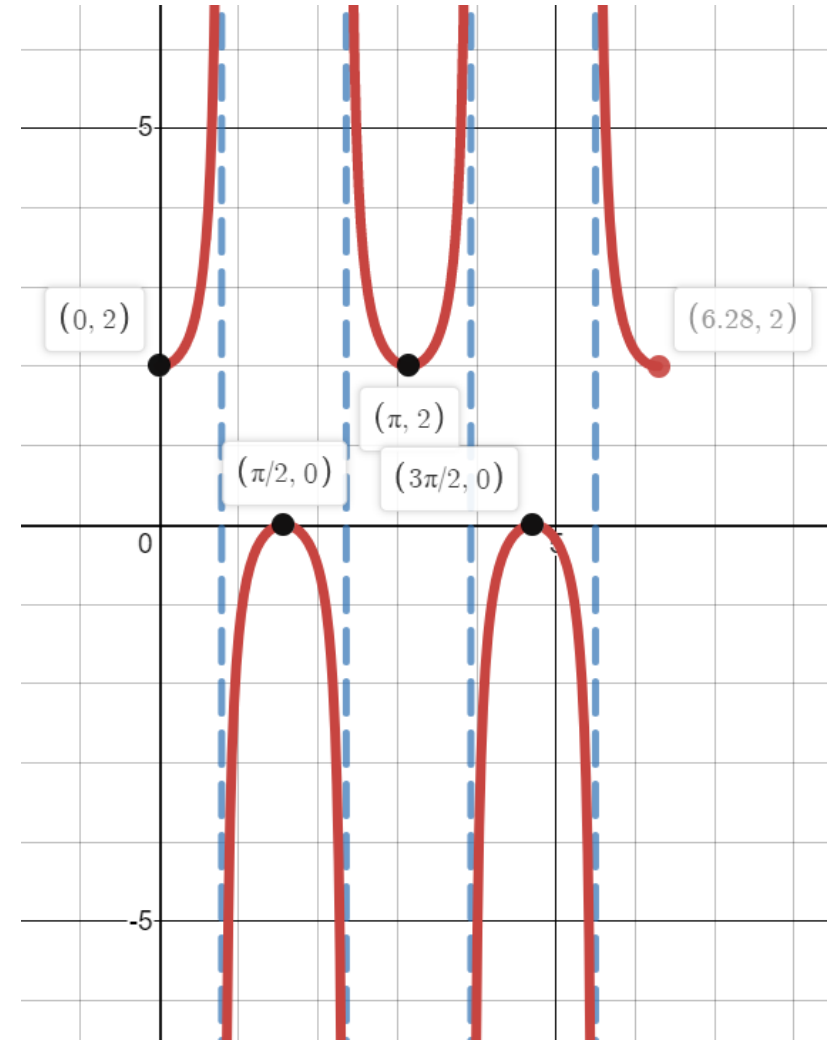
## Worked example

Sketch the graph in the interval  $0 \leq x \leq 2\pi$ :  
 $y = 6 + \operatorname{cosec} 4x$

$$y = \cot 3x - 5$$

## Your turn

Sketch the graph in the interval  $0 \leq x \leq 2\pi$ :  
 $y = 1 + \sec 2x$



## Worked example

State the range of:

$$y = \operatorname{cosec} x, x \in \mathbb{R}, x \neq n\pi, n \in \mathbb{Z}$$

$$y = \cot x, x \in \mathbb{R}, x \neq n\pi, n \in \mathbb{Z}$$

## Your turn

State the range of:

$$y = \sec x, x \in \mathbb{R}, x \neq \frac{(2n+1)\pi}{2}, n \in \mathbb{Z}$$

$$\sec x \leq -1 \text{ or } \sec x \geq 1$$

## Worked example

Find the range of values of  $k$  for which  $2 + 7 \sec x = k$  has no solutions.

Find the range of values of  $k$  for which  $3 \operatorname{cosec} x - 5 = k$  has no solutions

## Your turn

Find the range of values of  $k$  for which  $3 + 5 \sec x = k$  has no solutions.

$$-2 < k < 8$$

## Worked example

Find the maximum and minimum of the graph, stating the smallest positive values of  $\theta$  at which they occur:

$$y = \frac{1}{2 + 3 \sec \theta}$$

## Your turn

Find the maximum and minimum of the graph, stating the smallest positive values of  $\theta$  at which they occur:

$$y = \frac{1}{1 + 2 \operatorname{cosec} \theta}$$

$$\text{Maximum } \frac{1}{3} \text{ at } \theta = \frac{\pi}{2}$$

$$\text{Minimum } -1 \text{ at } \theta = \frac{3\pi}{2}$$