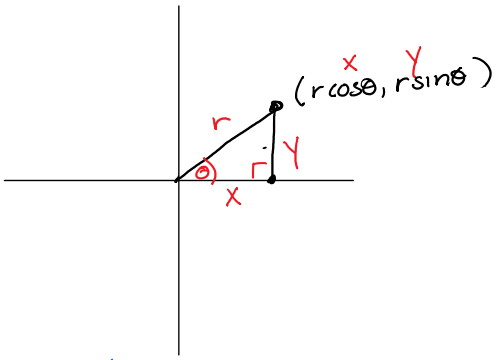
# 4.5

Wednesday, March 6, 2019 8:03 AM

$\tan\theta = \frac{\sin\theta}{\cos\theta} = \frac{1}{\cot\theta}$ $\sec\theta = \frac{1}{\cos\theta}$

$\cot\theta = \frac{\cos\theta}{\sin\theta} = \frac{1}{\tan\theta}$ $\csc\theta = \frac{1}{\sin\theta}$




r = radius

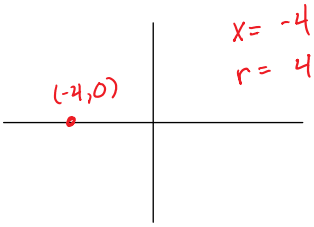
$\cos\theta = \frac{x}{r}$ $\sec\theta = \frac{r}{x}$

$\sin\theta = \frac{y}{r}$ $\csc\theta = \frac{r}{y}$

$\tan\theta = \frac{y}{x}$ $\cot\theta = \frac{x}{y}$

example

$(-4,0)$ find $\cos\theta$




$x = -4$

$r = 4$

$\cos\theta = \frac{x}{r} = \frac{-4}{4} = -1$

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Find x over the given interval

① $\csc x = 2$ $\frac{\pi}{2} \le x < \pi$

$\sin x = \frac{1}{2}$ $x = \frac{5\pi}{6}$

② $\tan x = \frac{1}{\sqrt{3}}$ $\frac{\pi}{2} \le x \le \frac{3\pi}{2}$

$x = \frac{7\pi}{6}$

you try...

③ $\sin x = 1/2$ $-\frac{\pi}{2} \le x \le 0$

not possible

④ $\csc x = \frac{2}{\sqrt{3}}$ $0 \le x < 2\pi$

$\sin x = \frac{\sqrt{3}}{2}$

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

⑤ $\cot x = -1$ $-\pi \le x \le 0$

$x = -\pi/4$

part also over $x \in \mathbb{R}$

⑥ $\sec x = -1$ $0 \le x < 2\pi$

$x = \pi$

$x = -\frac{\pi}{4} + \pi k$ where $k$ = integer

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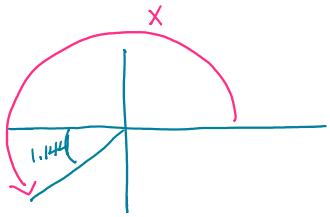
with calculator

$\tan x = 2.2$ $\quad 0 \le x \le \pi/2$

$x = \tan^{-1}(2.2)$ $\quad x \approx 1.144$


$0 \le x < 2\pi$

$x \approx 1.144$

$x \approx 4.286$

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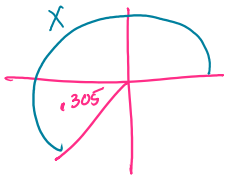
$\sin x = -.3$ $\quad \pi \le x \le \frac{3\pi}{2}$

Reference Angle

$x = \sin^{-1}(.3)$

$\approx .305$




$x \approx 3.446$

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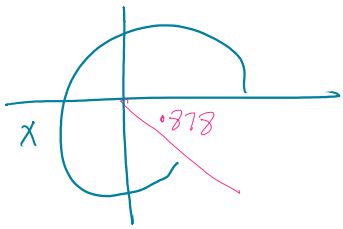
$\csc x = -1.3$ $\quad \frac{3\pi}{2} \le x \le 2\pi$




Reference Angle

$\csc x = 1.3$

$\frac{1}{\sin x} = 1.3$

$\frac{1}{1.3} = \sin x$

$x = \sin^{-1}\left(\frac{1}{1.3}\right)$

$x \approx .878$

$x \approx 5.406$

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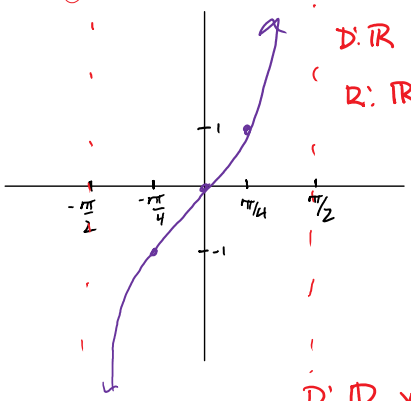
$y = \tan x$ $\quad$ K = integer $\quad$ $y = \cot x$ $\quad$ D: $\mathbb{R}$ $x = 0 + \pi k$ R: $\mathbb{R}$

K = integer

## $y = \tan x$



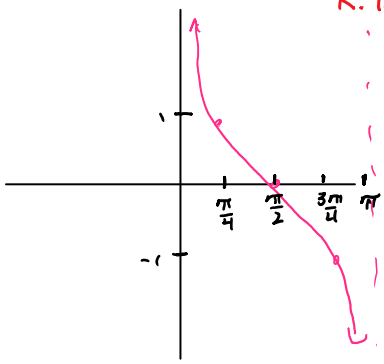

D: $\mathbb{R}$ $x \neq \frac{\pi}{2} + \pi k$

R: $\mathbb{R}$

## $y = \cot x$

D: $\mathbb{R}$ $x = 0 + \pi k$

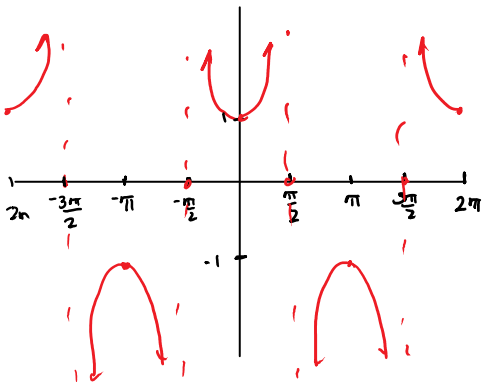
R: $\mathbb{R}$




## $y = \sec x$

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

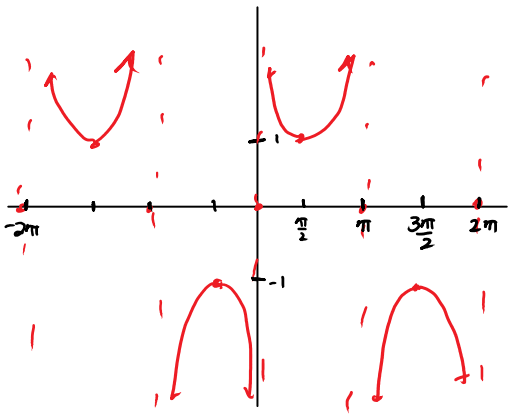
R: $(-\infty, -1] \cup [1, \infty)$




## $y = \csc x$

D: $\mathbb{R}$ $x \neq 0 + \pi k$

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

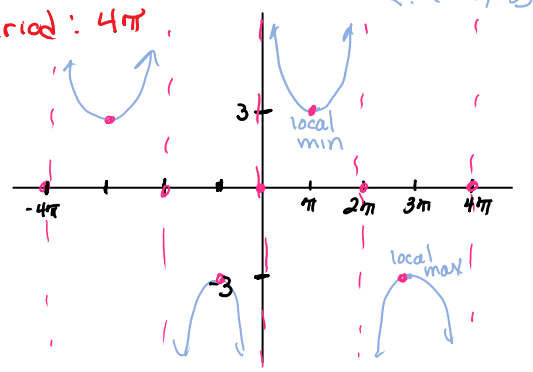



ex: $y = 3\csc\left(\frac{1}{2}x\right)$

D: $\mathbb{R}$ $x \neq 0 + 2\pi k$

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

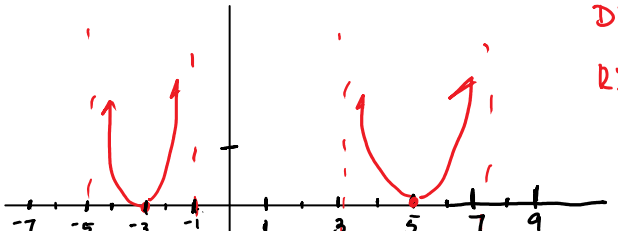
period: $4\pi$




$y = -1\theta \sec\left[\frac{\pi}{4}(x-1)\right]$

Period 8 HTR 2

hd: Right 1



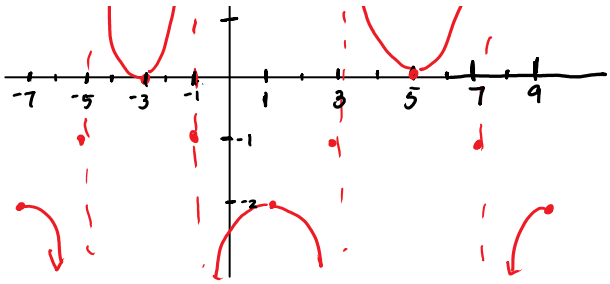

D: $\mathbb{R}$ $x \neq -1 + 4k$

R: $(-\infty, -2] \cup [0, \infty)$

Period 8 QTR 2

pd: Right 1

vs ↓ 1




$y = \tan(\pi x)$