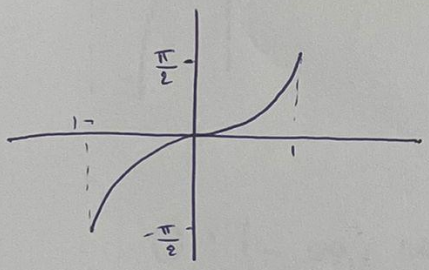
Shaimaa HJijah

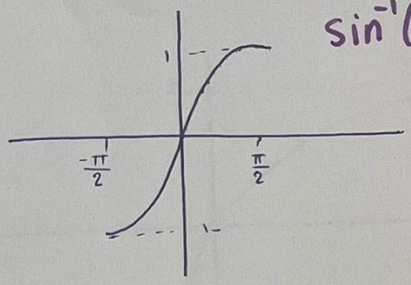
7.6 invers trig func

$\sin x \quad [-\frac{\pi}{2}, \frac{\pi}{2}]$

↳ $\sin^{-1}(x)$



$\sin^{-1}(x)$



Domain $[-1, 1]$

Range $[-\frac{\pi}{2}, \frac{\pi}{2}]$

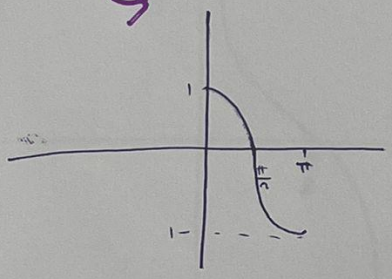
Odd fun → $\sin^{-1}(-x) = -\sin^{-1}(x)$

$\sin^{-1}(x) + \sin^{-1}(-x) = 0$

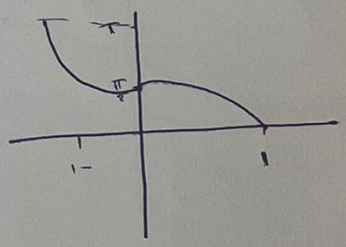
- - - - - →

$\cos x \quad [0, \pi]$

↳



$\cos^{-1}(x)$



$\cos^{-1}(x) + \cos^{-1}(-x) = \pi$

$\cos^{-1}(x) + \sin^{-1}(x) = \frac{\pi}{2}$

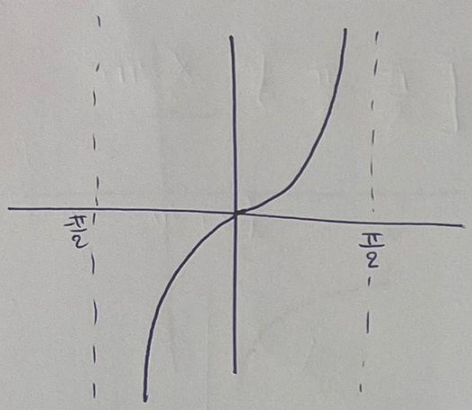
D: $[-1, 1]$

R: $[0, \pi]$

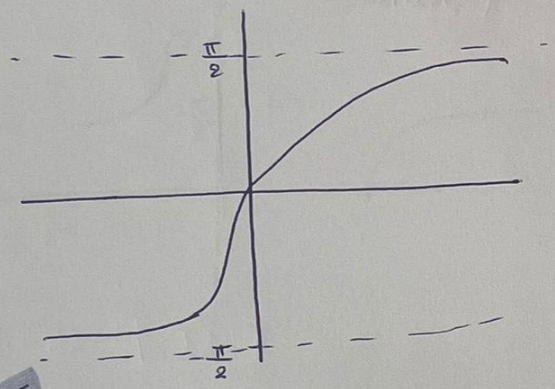
← not even nor odd

Shaimaa

$\tan x \quad \left(-\frac{\pi}{2}, \frac{\pi}{2}\right)$



$\tan^{-1}(x)$

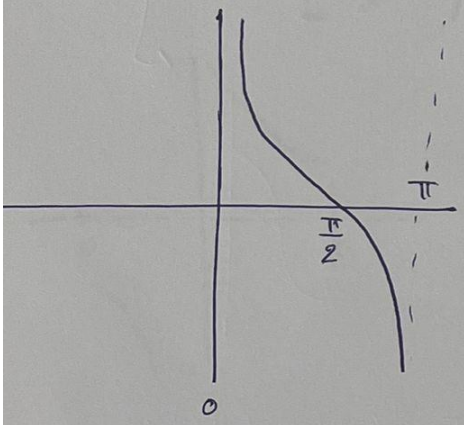


$D: (-\infty, \infty)$

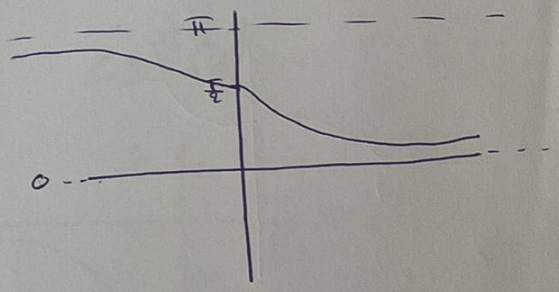
$R: \left(-\frac{\pi}{2}, \frac{\pi}{2}\right)$

Odd Function → $\tan^{-1}(-x) = -\tan^{-1}(x)$

$\cot (0, \pi)$



$\cot^{-1}(x)$



$D: -\infty, \infty$

$R: (0, \pi)$

$\tan^{-1}(x) + \cot^{-1}(x) = \frac{\pi}{2}$

← not even nor odd

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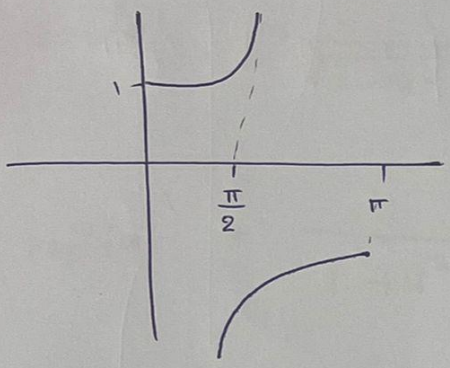
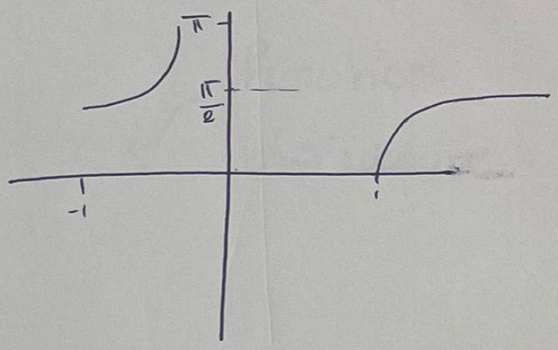
$\sec(x)$ $[0, \frac{\pi}{2}) \cup (\frac{\pi}{2}, \pi]$



$\sec^{-1}(x)$



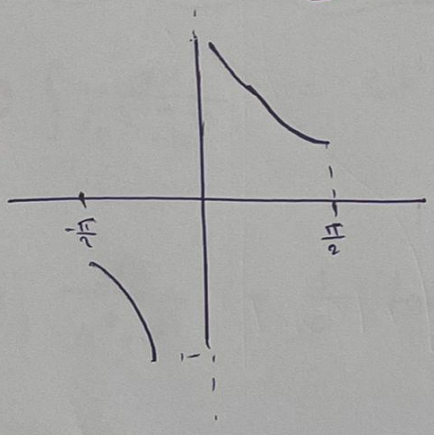
D $(-\infty, -1] \cup [1, \infty)$

R $[0, \frac{\pi}{2}) \cup (\frac{\pi}{2}, \pi]$

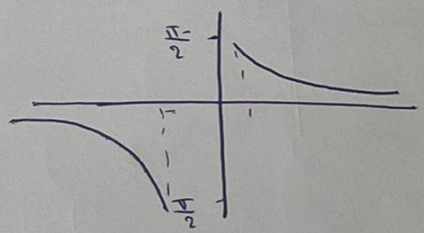
not even nor odd

$\sec^{-1}(x) = \cos^{-1}(\frac{1}{x})$

$\csc x$ $[-\frac{\pi}{2}, 0) \cup (0, \frac{\pi}{2}]$



$\csc^{-1}(x)$



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

D $(-\infty, -1] \cup [1, \infty)$

R = D csc

not even nor odd

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Trigonemetric Functions derivative.

① $\sin^{-1}(u)' = \frac{1}{\sqrt{1-u^2}} \cdot u'$

② $\cos^{-1}(u)' = \frac{-1}{\sqrt{1-u^2}} \cdot u'$

③ $\tan^{-1}(u)' = \frac{1}{1+u^2} \cdot u'$

④ $\cot^{-1}(u)' = \frac{-1}{1+u^2} \cdot u'$

⑤ $\sec^{-1}(u)' = \frac{1}{|u|\sqrt{u^2-1}} u'$

⑥ $\csc^{-1}(u)' = \frac{-1}{|u|\sqrt{u^2-1}} \cdot u'$

Trigonometric integrals

① $\int \frac{du}{\sqrt{a^2-u^2}} = \sin^{-1}\left|\frac{u}{a}\right| + C$

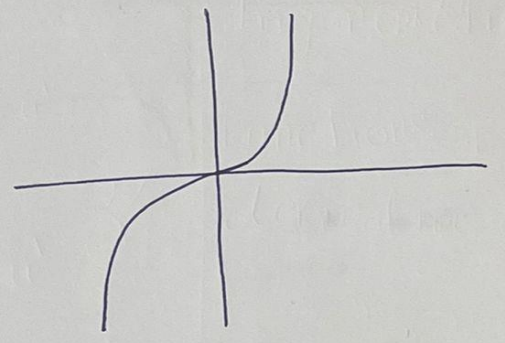
② $\int \frac{du}{a^2+u^2} = \frac{1}{a}\tan^{-1}\left(\frac{u}{a}\right| + C$

③ $\int \frac{du}{u\sqrt{u^2-a^2}} = \frac{1}{a}\sec^{-1}\left|\frac{u}{a}\right| + C$

7.7 hyperbolic

Shaimaa

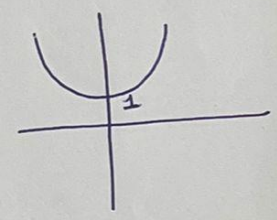
(1) $\sinh x = \frac{e^x - e^{-x}}{2}$ →



D: $\mathbb{R}$ = Range

odd function $\Rightarrow \sinh(-x) = -\sinh x$

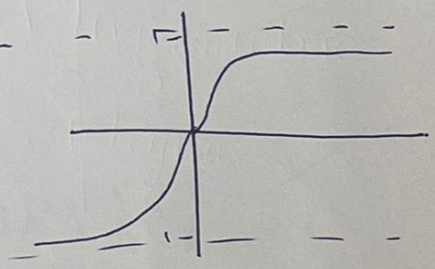
(2) $\cosh x = \frac{e^x + e^{-x}}{2}$ →



D: $\mathbb{R}$, R: $[1, \infty)$

even function $\Rightarrow \cosh(-x) = \cosh x$

(3) $\tanh x = \frac{\sinh x}{\cosh x} = \frac{e^x - e^{-x}}{e^x + e^{-x}}$



D: $(-\infty, \infty)$, R: $(-1, 1)$

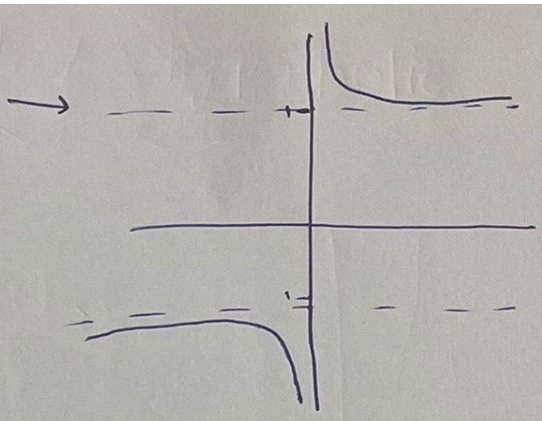
odd function $\Rightarrow \tanh(-x) = -\tanh(x)$

$\lim_{x \to \infty} = 1$

$\lim_{x \to -\infty} = -1$

$y = 1, -1$ H.A

$$\coth x = \frac{e^x + e^{-x}}{e^x - e^{-x}}$$



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D: $\mathbb{R} \setminus \{0\}$

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

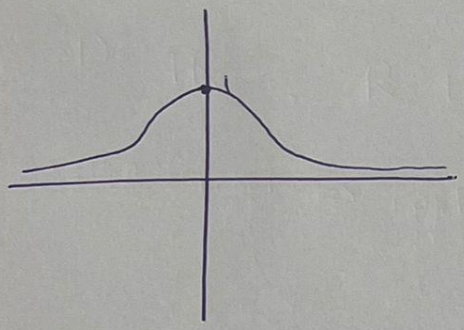
odd Function

$\lim_{x \to 0} = \infty \quad x = 0$

$\lim_{x \to \infty} = 1$] $y = 1$

$\lim_{y \to -\infty} = -1$

(5) $\operatorname{sech} x = \frac{1}{\cosh x}$



D $\Rightarrow \mathbb{R}$

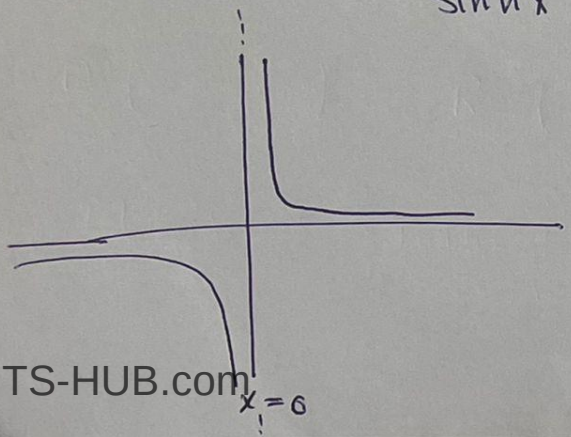
R $\Rightarrow [0, 1]$

even Function

$\lim_{x \to \infty} = 0$

$y = 0$ H.A

(6) $\operatorname{csch} x = \frac{1}{\sinh x}$



D : $\mathbb{R} \setminus \{0\}$

R $(-\infty, 0) \cup (0, \infty)$

odd