Class 12 Maths Chapter 2: Inverse Trigonometric Functions - Notes, Important Questions and MCQs (2026-27)

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These Class 12 Maths Chapter 2 notes cover “Inverse Trigonometric Functions” from the NCERT Mathematics Part I textbook (2026-27): why trigonometric functions need restricted domains to be invertible, domains and principal value branches of $\sin^{-1}$, $\cos^{-1}$, $\tan^{-1}$, cosec^{-1}, $\sec^{-1}$ and $\cot^{-1}$, their graphs and elementary properties – with tables, solved examples, Q&A, 10 MCQs and a free PDF.

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Chapter Overview

Trigonometric functions are periodic and so not one-one on their natural domains. By restricting each to an interval where it is one-one and onto, we obtain an inverse function. The interval of the range chosen is called the principal value branch.

For example, $\sin : [-\pi/2, \pi/2] \to [-1, 1]$ is bijective, so $\sin^{-1} : [-1, 1] \to [-\pi/2, \pi/2]$. Note that $\sin^{-1}x$ is not $(\sin x)^{-1}$.

Important Topics and Concepts

Basic Idea

- A function has an inverse only if it is bijective.

- Trigonometric functions are restricted to intervals to make them bijective.
- $\sin^{-1}x$ is also written arcsin x.
- $\sin^{-1}x \neq 1/\sin x$.
- The value in the principal branch is the principal value.

Domains and Principal Value Branches

- $\sin^{-1} : [-1, 1] \to [-\pi/2, \pi/2]$.
- $\cos^{-1} : [-1, 1] \to [0, \pi]$.
- $\tan^{-1} : R \to (-\pi/2, \pi/2)$.
- $\cot^{-1} : R \to (0, \pi)$.
- $\sec^{-1} : R - (-1, 1) \to [0, \pi] - \{\pi/2\}$.
- $\text{cosec}^{-1} : R - (-1, 1) \to [-\pi/2, \pi/2] - \{0\}$.

Graphs

- The graph of an inverse function is the reflection of the original graph (restricted) in the line y = x.
- $\sin^{-1}$ graph rises from $(-1, -\pi/2)$ to $(1, \pi/2)$.
- $\cos^{-1}$ graph falls from $(-1, \pi)$ to $(1, 0)$.
- $\tan^{-1}$ graph has horizontal asymptotes $y = \pm\pi/2$.

Elementary Properties

- $\sin(\sin^{-1}x) = x$ for $x \in [-1, 1]$; $\sin^{-1}(\sin x) = x$ for $x \in [-\pi/2, \pi/2]$.
- $\sin^{-1}(-x) = -\sin^{-1}x$; $\tan^{-1}(-x) = -\tan^{-1}x$; $\text{cosec}^{-1}(-x) = -\text{cosec}^{-1}x$.
- $\cos^{-1}(-x) = \pi - \cos^{-1}x$; $\sec^{-1}(-x) = \pi - \sec^{-1}x$; $\cot^{-1}(-x) = \pi - \cot^{-1}x$.
- $\sin^{-1}x + \cos^{-1}x = \pi/2$; $\tan^{-1}x + \cot^{-1}x = \pi/2$; $\sec^{-1}x + \text{cosec}^{-1}x = \pi/2$.
- $\sin^{-1}(1/x) = \text{cosec}^{-1}x$; $\cos^{-1}(1/x) = \sec^{-1}x$.

Finding Principal Values

- Find the angle in the principal branch whose trigonometric value is given.
- $\sin^{-1}(1/2) = \pi/6$.
- $\cos^{-1}(-1/2) = \pi - \pi/3 = 2\pi/3$.
- $\tan^{-1}(-1) = -\pi/4$.
- $\sin^{-1}(\sin 2\pi/3) = \pi/3$, since $2\pi/3$ is not in $[-\pi/2, \pi/2]$.

Solved Examples

Board-pattern practice.

- Find $\cos^{-1}(-\sqrt{3}/2)$. $\pi - \pi/6 = 5\pi/6$.
- Evaluate $\tan^{-1}(1) + \cos^{-1}(-1/2) + \sin^{-1}(-1/2)$. $\pi/4 + 2\pi/3 - \pi/6 = 3\pi/4$.
- Find $\sec^{-1}(-2)$. $\pi - \pi/3 = 2\pi/3$.
- Find $\cot^{-1}(-1/\sqrt{3})$. $\pi - \pi/3 = 2\pi/3$.
- Find $\sin^{-1}(\sin 3\pi/5)$. $\sin 3\pi/5 = \sin 2\pi/5$, so answer $= 2\pi/5$.

Inverse Trigonometric Functions – Domain and Range

Function	Domain	Principal value branch (range)
$\sin^{-1}x$	$[-1, 1]$	$[-\pi/2, \pi/2]$

Function	Domain	Principal value branch (range)
$\cos^{-1}x$	[–1, 1]	[0, π]
$\tan^{-1}x$	R	(–π/2, π/2)
$\cot^{-1}x$	R	(0, π)
$\sec^{-1}x$	R – (–1, 1)	[0, π] – {π/2}
$\text{cosec}^{-1}x$	R – (–1, 1)	[–π/2, π/2] – {0}

Important Definitions and Terms

Term	Meaning
Inverse function	Function that reverses another bijective function
Principal value branch	Chosen range of an inverse trig function
Principal value	Value lying in the principal branch
$\sin^{-1}x$	Angle in [–π/2, π/2] whose sine is x
$\cos^{-1}x$	Angle in [0, π] whose cosine is x
$\tan^{-1}x$	Angle in (–π/2, π/2) whose tangent is x
arcsin	Another name for $\sin^{-1}$
Restriction	Limiting domain to make a function bijective
Reflection in y = x	Graph relation of a function and its inverse
Asymptote	Line a curve approaches but never meets

Short Answer Questions

Q1. Why do trigonometric functions need restricted domains to have inverses?

Because they are periodic and not one-one on their full domains.

Q2. Write the principal value branch of $\cos^{-1}$.

[0, π].

Q3. Find $\sin^{-1}(–1/2)$.

–π/6.

Q4. Find $\cos^{-1}(1/2)$.

π/3.

Q5. What is $\sin^{-1}x + \cos^{-1}x$?

π/2, for $x \in [–1, 1]$.

Q6. Find $\tan^{-1}(\sqrt{3})$.

π/3.

Q7. What is the domain of $\sec^{-1}x$?

R – (–1, 1), i.e. $|x| \geq 1$.

Q8. Is $\sin^{-1}x$ equal to 1/sin x?

Long Answer Questions

Q1. Find the value of $\sin^{-1}(1/2) + 2\cos^{-1}(-1/2)$.

$\sin^{-1}(1/2) = \pi/6$.

$\cos^{-1}(-1/2) = \pi - \pi/3 = 2\pi/3$.

$2\cos^{-1}(-1/2) = 4\pi/3$.

Sum $= \pi/6 + 4\pi/3$.

$= 3\pi/2$.

Q2. Find the principal value of $\cos^{-1}(\cos 7\pi/6)$.

$7\pi/6$ is not in $[0, \pi]$.

$\cos 7\pi/6 = \cos(2\pi - 7\pi/6) = \cos 5\pi/6$.

$5\pi/6 \in [0, \pi]$.

So $\cos^{-1}(\cos 7\pi/6) = 5\pi/6$.

Always bring the angle into the principal branch.

Q3. State the domain and range of all six inverse trigonometric functions.

$\sin^{-1}$: $[-1, 1] \to [-\pi/2, \pi/2]$.

$\cos^{-1}$: $[-1, 1] \to [0, \pi]$.

$\tan^{-1}$: $R \to (-\pi/2, \pi/2)$; $\cot^{-1}$: $R \to (0, \pi)$.

$\sec^{-1}$: $|x| \geq 1 \to [0, \pi] - \{\pi/2\}$.

cosec^{-1}: $|x| \geq 1 \to [-\pi/2, \pi/2] - \{0\}$.

MCQs with Answers

1. Range of $\sin^{-1}x$(a) $[0, \pi]$ (b) $[-\pi/2, \pi/2]$ (c) $(0, \pi)$ (d) RAnswer: (b) $[-\pi/2, \pi/2]$

2. $\cos^{-1}(-1/2)$ =(a) $\pi/3$ (b) $2\pi/3$ (c) $-\pi/3$ (d) $5\pi/6$Answer: (b) $2\pi/3$

3. $\tan^{-1}(-1)$ =(a) $\pi/4$ (b) $-\pi/4$ (c) $3\pi/4$ (d) $-3\pi/4$Answer: (b) $-\pi/4$

4. Domain of $\tan^{-1}x$(a) $[-1, 1]$ (b) R (c) R – $(-1, 1)$ (d) $(0, \pi)$Answer: (b) R

5. $\sin^{-1}x + \cos^{-1}x$ =(a) π (b) $\pi/2$ (c) 0 (d) $\pi/4$Answer: (b) $\pi/2$

6. Range of $\cot^{-1}x$(a) $(-\pi/2, \pi/2)$ (b) $(0, \pi)$ (c) $[0, \pi]$ (d) $[-\pi/2, \pi/2]$Answer: (b) $(0, \pi)$

7. $\sin^{-1}(\sin 2\pi/3)$ =(a) $2\pi/3$ (b) $\pi/3$ (c) $-\pi/3$ (d) $\pi/6$Answer: (b) $\pi/3$

8. $\sec^{-1}(2)$ =(a) $\pi/6$ (b) $\pi/3$ (c) $2\pi/3$ (d) $\pi/4$Answer: (b) $\pi/3$

9. $\cos^{-1}(-x)$ =(a) $-\cos^{-1}x$ (b) $\pi - \cos^{-1}x$ (c) $\pi + \cos^{-1}x$ (d) $\cos^{-1}x$Answer: (b) $\pi - \cos^{-1}x$

10. Domain of $\sin^{-1}x$(a) R (b) $[-1, 1]$ (c) $(0, 1)$ (d) $[0, \pi]$Answer: (b) $[-1, 1]$

Quick Revision Points

- Restrict domain to make bijective.
- Six domain–range pairs.
- Graphs are reflections in y = x.
- Negative-argument properties.
- Complementary sums equal π/2.
- Bring angle into principal branch.

Chapter Summary

Inverse trigonometric functions exist only after restricting trigonometric functions to intervals where they are bijective. Each inverse function has a fixed domain and principal value branch, such as $\sin^{-1} : [-1, 1] \to [-\pi/2, \pi/2]$ and $\cos^{-1} : [-1, 1] \to [0, \pi]$.

Principal values are found by choosing the angle in the branch. Properties like $\sin^{-1}(-x) = -\sin^{-1}x$, $\cos^{-1}(-x) = \pi - \cos^{-1}x$ and $\sin^{-1}x + \cos^{-1}x = \pi/2$ simplify expressions.

Exam Tips and PYQ Pattern

- Memorise the domain–range table first.
- Check the angle lies in the principal branch.
- Use π – θ for $\cos^{-1}$, $\sec^{-1}$, $\cot^{-1}$ of negatives.
- Draw a quick unit circle for values.
- Practise expressions combining several functions.

Frequently Asked Questions

Is this chapter in the 2026-27 CBSE syllabus?

Yes. It is part of the NCERT Class 12 Mathematics Part I textbook, prescribed in the CBSE 2026-27 syllabus.

Can I download these notes as a PDF?

Yes. Use the free PDF link at the top of this page – no signup needed.

What is the principal value branch of $\sin^{-1}x$?

$[-\pi/2, \pi/2]$.

What is $\cos^{-1}(-x)$?

$\cos^{-1}(-x) = \pi - \cos^{-1}x$ for $x \in [-1, 1]$.

Conclusion

Inverse Trigonometric Functions is short and scoring. Learn the table and properties and save the free PDF.

More Notes: Class 12 Maths Chapter 1: Relations and Functions notes | Class 12 Maths Chapter 3: Matrices notes | All Class 12 Maths notes

Freshness Note: These notes follow the NCERT Class 12 Maths textbook, Mathematics Part I (NCERT reprint 2026-27, rationalised syllabus), and the CBSE syllabus for the 2026-27 session. Last checked on 26 November 2026.