CBSE CLASS 12 MATHS · CHAPTER 2 · 2026-27

Inverse Trigonometric Functions Class 12 Important Questions

10 questions · 27 marks · no calculator · step-marked answers

Name _____ Date _____ Score / 27

- Original questions in the board paper's question types, from 1-mark MCQs to a case study. Try every question before you look at the answers.
- No calculator: as in the CBSE board exam, everything works by hand.
- Worked answers with step marks for 5 questions start after the questions. The other 5 open free on the chapter page with a free account (no card): the link is next to each one.
- Online, with more practice: cbsemathrevision.com/class-12/inverse-trigonometric-functions

Section A · Multiple choice and assertion–reason (1 mark each)

1. 1 mark · Principal values

What is the principal value of $\sec^{-1}(-\sqrt{2})$?

(a) $-\frac{\pi}{4}$ (b) $\frac{3\pi}{4}$

(c) $\frac{5\pi}{4}$ (d) $\frac{\pi}{4}$

2. 1 mark · Domain and range

The domain of $\sin^{-1}(2x-1)$ is

(a) $[0,1]$ (b) $[-1,1]$

(c) $[-1,0]$ (d) $[0,2]$

3. 1 mark · Principal values

In the following question, a statement of Assertion (A) is followed by a statement of Reason (R). Choose the correct option.

Assertion (A): $\sin^{-1}\left(\sin\frac{3\pi}{4}\right)=\frac{3\pi}{4}$.

Reason (R): The principal value branch of $\sin^{-1}$ has range $\left[-\frac{\pi}{2},\frac{\pi}{2}\right]$.

(a) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).

(b) Both Assertion (A) and Reason (R) are true but Reason (R) is not the correct explanation of Assertion (A).

(c) Assertion (A) is true but Reason (R) is false.

(d) Assertion (A) is false but Reason (R) is true.

Section B · Short answer (2 marks each)

4. 2 marks · Evaluating expressions

Find the value of $\cot^{-1}(\sqrt{3}) + \sec^{-1}(2) - \tan^{-1}(-1)$.

5. 2 marks · Principal values

Find the principal value of $\cos^{-1}\left(\cos\dfrac{5\pi}{3}\right)$.

Section C · Short answer (3 marks each)

6. 3 marks · Domain and range

Find the domain of $f(x) = \sin^{-1}(x^2 - 3)$.

7. 3 marks · Evaluating expressions

Find the values of (a) $\cos\left(\tan^{-1}\sqrt{3} + \cot^{-1}\sqrt{3}\right)$ and (b) $\tan\left(\sin^{-1}\dfrac{\sqrt{3}}{2} - \cos^{-1}\dfrac{\sqrt{3}}{2}\right)$.

Section D · Long answer (5 marks each)

8. **5 marks · Principal values**

(a) Find the principal values of $\sin^{-1}\dfrac{\sqrt{3}}{2}$, $\cos^{-1}\left(-\dfrac{1}{\sqrt{2}}\right)$, $\tan^{-1}(-\sqrt{3})$ and $\operatorname{cosec}^{-1}(-2)$. (b) Hence find $\sin^{-1}\dfrac{\sqrt{3}}{2}+\cos^{-1}\left(-\dfrac{1}{\sqrt{2}}\right)-\tan^{-1}(-\sqrt{3})-\operatorname{cosec}^{-1}(-2)$.

9. **5 marks · Domain and range**

Let $f(x)=2\cos^{-1}(1-x)$. (a) Find the domain and the range of f. (b) Find $f(1)$. (c) Solve $f(x)=\dfrac{2\pi}{3}$.

Section E · Case study (4 marks)

10. **4 marks · Evaluating expressions**

Road gradients. A road rises 1 m for every 1 m travelled horizontally on one stretch, and $\sqrt{3}$ m for every 1 m on a steeper stretch. The angle of a stretch with the horizontal is $\theta = \tan^{-1}(\text{rise per metre})$.

i. Find the angle of the first stretch. *[1 mark]*

ii. State the range of the principal value branch of $\tan^{-1}$. *[1 mark]*

iii. By how much is the steeper stretch steeper, in radians? *[2 marks]*

Answers and worked solutions

Question 1 — 1 mark

The principal branch of $\sec^{-1}$ is $[0, \pi] - \left\{\frac{\pi}{2}\right\}$, and $\sec\frac{3\pi}{4} = -\sqrt{2}$ **A1**

Correct option: (b) $\frac{3\pi}{4}$

Question 2 — 1 mark

Worked answer: free with a free account (no card) on the chapter page: cbsemathrevision.com/class-12/inverse-trigonometric-functions#iq-2

Question 3 — 1 mark

Worked answer: free with a free account (no card) on the chapter page: cbsemathrevision.com/class-12/inverse-trigonometric-functions#iq-3

Question 4 — 2 marks

Answer: $\frac{3\pi}{4}$

$\cot^{-1}\sqrt{3} = \frac{\pi}{6}$, $\sec^{-1}2 = \frac{\pi}{3}$, $\tan^{-1}(-1) = -\frac{\pi}{4}$ **M1**

Sum $= \frac{\pi}{6} + \frac{\pi}{3} + \frac{\pi}{4} = \frac{3\pi}{4}$ **A1**

Question 5 — 2 marks

Worked answer: free with a free account (no card) on the chapter page: cbsemathrevision.com/class-12/inverse-trigonometric-functions#iq-5

Question 6 — 3 marks

Answer: $[-2, -\sqrt{2}] \cup [\sqrt{2}, 2]$

Need $-1 \le x^2 - 3 \le 1$, i.e. $2 \le x^2 \le 4$ **M1**

$x^2 \le 4 \Rightarrow -2 \le x \le 2$; $x^2 \ge 2 \Rightarrow x \le -\sqrt{2}$ or $x \ge \sqrt{2}$ **A1**

Domain $= [-2, -\sqrt{2}] \cup [\sqrt{2}, 2]$ **A1**

Question 7 — 3 marks

Worked answer: free with a free account (no card) on the chapter page: cbsemathrevision.com/class-12/inverse-trigonometric-functions#

Question 8 — 5 marks

Answer: $\frac{\pi}{3}, \frac{3\pi}{4}, -\frac{\pi}{3}, -\frac{\pi}{6}; \frac{19\pi}{12}$

$\sin^{-1}\frac{\sqrt{3}}{2} = \frac{\pi}{3}$ (in $\left[-\frac{\pi}{2}, \frac{\pi}{2}\right]$) **A1**

$\cos^{-1}\left(-\frac{1}{\sqrt{2}}\right) = \frac{3\pi}{4}$ (in $[0, \pi]$) **A1**

$\tan^{-1}(-\sqrt{3}) = -\frac{\pi}{3}$ (in $\left(-\frac{\pi}{2}, \frac{\pi}{2}\right)$) **A1**

$\operatorname{cosec}^{-1}(-2) = -\frac{\pi}{6}$ (in $\left[-\frac{\pi}{2}, \frac{\pi}{2}\right] - \{0\}$) **A1**

(b) $\frac{\pi}{3} + \frac{3\pi}{4} + \frac{\pi}{3} + \frac{\pi}{6} = \frac{4\pi + 9\pi + 4\pi + 2\pi}{12} = \frac{19\pi}{12}$ **A1**

Question 9 — 5 marks

Worked answer: free with a free account (no card) on the chapter page: cbsemathrevision.com/class-12/inverse-trigonometric-functions#

Question 10 — 4 marks

i. $\tan^{-1}1 = \frac{\pi}{4}$ **A1**

ii. $\left(-\frac{\pi}{2}, \frac{\pi}{2}\right)$ **A1**

iii. Steeper stretch: $\tan^{-1}\sqrt{3} = \frac{\pi}{3}$ **M1**

Difference $= \frac{\pi}{3} - \frac{\pi}{4} = \frac{\pi}{12}$ **A1**

More on this chapter, free: revision notes, a Route to 95 and practice with instant feedback at cbsemathrevision.com/class-12/inverse-trigonometric-functions

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