

Inverse Trigonometric Functions — Assignment 2

Class 12 Maths · Higher-difficulty challenge set + integrated problems · Answer key included · Narayan Gurukul Academy

Instructions: (1) Attempt all questions; start with the topic-wise challenge set, then attempt the integrated (multi-topic) problems.
(2) Give all answers with correct SI units. $g = 10 \text{ m/s}^2$ unless stated.
(3) A final answer key is provided at the end — try the full set before checking it.

Part A — Topic-wise challenge questions

Principal Value Branches

1. Find the principal value of $\sin^{-1}(1/2)$.
2. Find the principal value of $\cos^{-1}(1/2)$.
3. Find the principal value of $\tan^{-1}(-1)$ and explain why it lies in $(-\pi/2, \pi/2)$.

Standard Values and Symmetry

1. Find the value of $\sin^{-1}(1/2) + \cos^{-1}(1/2)$.
2. Evaluate $\cos^{-1}(-1/2)$.
3. Find the value of $\tan^{-1}(1) + \tan^{-1}(\sqrt{3})$.

Key Identities

1. Evaluate $\tan^{-1}(1/2) + \tan^{-1}(1/3)$.
2. Express $2 \tan^{-1} x$ as a single inverse tangent.
3. Prove that $\tan^{-1}(1/2) + \tan^{-1}(2/11) = \tan^{-1}(3/4)$.

Solving Equations

1. Solve $\tan^{-1}(2x) = \pi/4$.
2. Solve $\sin^{-1}(x) = \cos^{-1}(x)$.
3. Solve $\tan^{-1}(x) + \tan^{-1}(2x) = \pi/4$.

Part B — Integrated problems (multi-topic)

1. Find the principal value of $\sin^{-1}(1/2)$.
2. Find the value of $\sin^{-1}(1/2) + \cos^{-1}(1/2)$.
3. Evaluate $\tan^{-1}(1/2) + \tan^{-1}(1/3)$.
4. Solve $\tan^{-1}(2x) = \pi/4$.
5. Solve $\sin^{-1}(x) = \cos^{-1}(x)$.

Answer Key

Principal Value Branches

$\sin^{-1}(1/2) = \pi/6$. $\cos^{-1}(1/2) = \pi/3$. $\tan^{-1}(-1) = -\pi/4$.

Standard Values and Symmetry

$$\pi/2. \cos^{-1}(-1/2) = 2\pi/3. \tan^{-1}(1) + \tan^{-1}(\sqrt{3}) = \pi/4 + \pi/3 = 7\pi/12.$$

Key Identities

$$\pi/4. 2 \tan^{-1} x = \tan^{-1}(2x/(1 - x^2)). \text{ Proof as in notes.}$$

Solving Equations

$$x = 1/2. x = 1/\sqrt{2}. x = 1/3.$$

Integrated problems

$$1: \pi/6. 2: \pi/2. 3: \pi/4. 4: x = 1/2. 5: x = 1/\sqrt{2}.$$