SmartKalike

CBSE Class 12 · Maths

Inverse Trigonometric Functions

10 most probable questions for Boards 2027

Q1. 1 mark · Multiple choice

Which statement gives the ranges of sine and cosine on their natural domains?

(A) Both have range R

(B) Both have range [−1, 1]

(C) Sine has range R and cosine has range [−1, 1]

(D) Sine has range [−1, 1] and cosine has range R

Answer

(B) Both have range [−1, 1] — sine and cosine each have range [−1, 1] on their natural domains.

Q2. 2 marks · Short answer

Let $f : \{1, 2\} \to \{a, b\}$ be given by $f(1) = a$ and $f(2) = b$. Find f^{-1}, and verify that f^{-1} is a bijection and that $(f^{-1})^{-1} = f$.

Answer

$f^{-1} : \{a, b\} \to \{1, 2\}$

$f^{-1}(a) = 1$, $f^{-1}(b) = 2$

Range$(f^{-1}) = \{1, 2\}$

$f^{-1}(a) \neq f^{-1}(b)$

$\therefore f^{-1}$ is one-one and onto, hence bijective.

$(f^{-1})^{-1}(1) = a = f(1)$

$(f^{-1})^{-1}(2) = b = f(2)$

$\therefore (f^{-1})^{-1} = f$

Hence proved.

Q3. 3 marks · Medium answer

Evaluate $\sin^{-1}(\sin 2\pi/3)$ and $\tan^{-1}(\tan 3\pi/4)$, using the principal-value ranges of $\sin^{-1}$ and $\tan^{-1}$.

Answer

The principal-value ranges are $[-\pi/2, \pi/2]$ for $\sin^{-1}$ and $(-\pi/2, \pi/2)$ for $\tan^{-1}$.

$\sin^{-1}(\sin 2\pi/3)$

$= \sin^{-1}(\sin(\pi - \pi/3))$

$= \sin^{-1}(\sin \pi/3)$

$= \pi/3$

$\therefore \sin^{-1}(\sin 2\pi/3) = \pi/3$

$\tan^{-1}(\tan 3\pi/4)$

$= \tan^{-1}(\tan(-\pi/4))$

$= -\pi/4$

$\therefore \tan^{-1}(\tan 3\pi/4) = -\pi/4$

Q4. 5 marks · Long answer

For $x \in [-1,1]$ and $t \in [-\pi/2, \pi/2]$, establish the identities $\sin(\sin^{-1}x) = x$ and $\sin^{-1}(\sin t) = t$. Explain how the graph of an inverse function is related to the graph of the original function.

Answer

The principal branch restricts sine to $[-\pi/2, \pi/2]$, where it is one-one and has range $[-1, 1]$.
1. For $x \in [-1, 1]$, let $y = \sin^{-1}x$. Then $y \in [-\pi/2, \pi/2]$ and $\sin y = x$, by the definition of the inverse of the restricted sine function. Therefore, $\sin(\sin^{-1}x) = \sin y = x$.
2. For $t \in [-\pi/2, \pi/2]$, t is the unique angle in the principal range whose sine is $\sin t$. Hence $\sin^{-1}(\sin t) = t$.
3. The graph of an inverse function is the reflection of the graph of the original function in the line $y = x$, because the coordinates of corresponding points are interchanged.
Thus, both identities follow from the mutually inverse functions on their specified domains and ranges.

Q5. 1 mark · Very short answer

Find the range of $f(x) = \sin x$ when its domain is restricted to $[-\pi/2, \pi/2]$.

Answer

$f([-\pi/2, \pi/2]) = [-1, 1]$
$\therefore$ Range of f is $[-1, 1]$.

Q6. 2 marks · Short answer

Evaluate $\sin^{-1}(-1/2)$, and write the principal range in which your answer lies.

Full answer on SmartKalike: https://smartkalike.com/cbse/class-12/maths/inverse-trigonometric-functions

Q7. 3 marks · Medium answer

For $-1 \le x \le 1$, prove that $\sin^{-1}(2x\sqrt{(1-x^2)}) = 2\sin^{-1}x$, taking account of the principal-value range.

Full answer on SmartKalike: https://smartkalike.com/cbse/class-12/maths/inverse-trigonometric-functions

Q8. 5 marks · Long answer

Evaluate $\sin^{-1}(1/2)$ and $1/\sin(1/2)$. Explain why these expressions are different, and state what is meant by the principal value of an inverse trigonometric function.

Full answer on SmartKalike: https://smartkalike.com/cbse/class-12/maths/inverse-trigonometric-functions

Q9. 2 marks · Short answer

For $x > 1$, let $x = \sec\theta$. Show that $\cot^{-1}\sqrt{(x^2 - 1)} = \sec^{-1}x$.

Full answer on SmartKalike: https://smartkalike.com/cbse/class-12/maths/inverse-trigonometric-functions

Q10. 5 marks · Long answer

For $x \in [-1, 1]$ and $\theta \in [-\pi/2, \pi/2]$, evaluate $\sin(\sin^{-1}x)$ and $\sin^{-1}(\sin\theta)$. Hence, state the range condition needed for $\sin^{-1}(\sin\theta) = \theta$.

Full answer on SmartKalike: https://smartkalike.com/cbse/class-12/maths/inverse-trigonometric-functions

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