INDIAN SCHOOL AL WADI AL KABIR

Class XII (2025-26)

Mathematics *Worksheet 2 – Inverse Trigonometric Functions*

1. The domain of the function f(x) =$\sin^{-1}(x) + \sec^{-1}(x)$

   A -1 and 1 B [-1, 1] C R D R- (-1, 1)

2. If $\sec^{-1}(-x) = \frac{\pi}{8}$, *which of the* following is $\sec^{-1}(x)$?

   A $-\frac{\pi}{8}$ B $\frac{9\pi}{8}$ C $\frac{7\pi}{8}$ D *cannot be determined*

3. $\sin^{-1}\left(\frac{2^{x+1}}{1+4^x}\right)$ =?

   A $\tan^{-1}(2)$ B $2\tan^{-1}(x)$ C $\tan^{-1}(2^x)$ D $2\tan^{-1}(2^x)$

4. *The value of* $2\cos^{-1}\frac{1}{2} + 3\sin^{-1}\frac{1}{2}$ is

   A $\frac{7\pi}{6}$ **B** 0 *C* $\frac{3\pi}{4}$ **D** $\frac{\pi}{4}$

5. $\sin[\cot^{-1}\{\cos(\tan^{-1}x)\}] =$

   A $\frac{x}{\sqrt{x^2+1}}$ **B** $\frac{1}{\sqrt{x^2+1}}$ **C** $\sqrt{\frac{x^2+1}{x^2+2}}$ **D** $\frac{1}{\sqrt{x^2+2}}$

6. $\cos^{-1}\left(\cos\frac{2\pi}{3}\right) + \sin^{-1}(\sin\frac{2\pi}{3})$=

   A $\frac{\pi}{2}$ **B** $\frac{\pi}{3}$ **C** $\frac{4\pi}{3}$ **D** π

7. $\sin\left(2\cos^{-1}(-\frac{3}{5})\right)$:

   A $-\frac{3}{5}$ **B** $\frac{24}{25}$ **C** $-\frac{24}{25}$ **D** $\frac{4}{5}$

8. $\cot^{-1}\left(-\frac{1}{\sqrt{3}}\right) + \tan^{-1}(-1) =$

   A $\frac{\pi}{12}$ **B** $\frac{5\pi}{12}$ **C** $\frac{19\pi}{12}$ **D** $-\frac{7\pi}{12}$

9. $Sec^2(\tan^{-1}2) + cosec^2(\cot^{-1}3)$:

   A 15 **B** 11 **C** 13 **D** 5

10. $\tan\left(\frac{\pi}{4} + \frac{1}{2}\cos^{-1}\frac{a}{b}\right) + \tan\left(\frac{\pi}{4} - \frac{1}{2}\cos^{-1}\frac{a}{b}\right)$:

    A $\frac{2a}{b}$ **B** $\frac{b}{2a}$ **C** $\frac{2b}{a}$ **D** $-\frac{a}{2b}$

DIRECTION: In question number 11, a statement of **Assertion (A)** is followed by a statement of **Reason (R).**
Choose the correct option.

(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 and 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.

11. (A) $\cos^{-1}(1) = \pi$
(R) f(x) = cosx, f: R to R is neither one to one nor onto.

12. (A) Domain of $\sin^{-1}(2x-1)$ is [0, 1]
(R) Domain of $\sin^{-1}(x)$ is [-1, 1]

13. (A) $sin^{-1}\left(sin\frac{3\pi}{4}\right) = \frac{\pi}{4}$ (R) $sin^{-1}(sinx) = x.$

Very Short Answer Questions (2 marks)

14. $Simplify: tan^{-1}\left(\frac{cosx}{1 - sinx}\right).$

15. Find the domain of $\cos^{-1}(x^2 - 4)$.

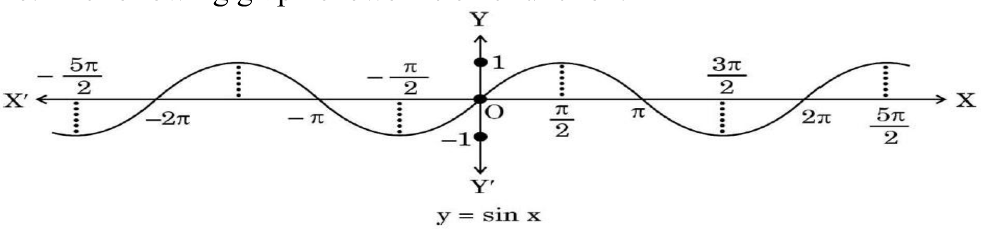
16. Sketch the graph of $\cos^{-1}x$ from [-1, 1] to its principal value branch.

17. Simplify: $tan^{-1}\left(\frac{\sqrt{1+x^2}-1}{x}\right).$

18. Evaluate: $sin^{-1}\left(sin\frac{2\pi}{3}\right) + cos^{-1}\left(cos\frac{2\pi}{3}\right) + tan^{-1}\left(tan\frac{2\pi}{3}\right).$

19. Solve for x: $tan^{-1}\left(\frac{cosx-sinx}{cosx+sinx}\right) = \frac{\pi}{8}$

20. Case study Based Question: If a function f : X to Y defined as f(x) = y is one-one and onto, then we can define a unique function g : Y to X such that g(y) = x, where $x \in X$ and y = f(x), $y \in Y$. Function g is called the inverse of function f.
The domain of sine function is R and function sine: R to R is neither one-one nor onto. The following graph shows the sine function.



y = sin x

Let sine function be defined from set A to [– 1, 1] such that inverse of sine function exists, i.e., $\sin^{-1} x$ is defined from [– 1, 1] to A.
On the basis of the above information, answer the following questions:

i) If A is the interval other than principal value branch, give an example of one such interval.
ii) If $\sin^{-1}(x)$ is defined from [– 1, 1] to its principal value branch, find the value of $sin^{-1}\left(-\frac{1}{2}\right) + sin^{-1}(1).$
iii) Find the domain and range of $f(x) = 2\sin^{-1}(1 - x)$.
iv) Sketch the graph of $\sin^{-1}x$ from [-1, 1] to its principal value branch.

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Answer Key

1.	A	**2.**	B	**3.**	D	**4.**	D
5.	A	**6.**	D	**7.**	C	**8.**	B
9.	A	**10**	C	**11.**	D	12	A
13.	C	**14.**	$\frac{\pi}{4}+\frac{x}{2}$	**15**	$[-\sqrt{5},-\sqrt{3}] \cup [\sqrt{3},\sqrt{5}]$	17	$\frac{1}{2}tan^{-1}x$
18	$\frac{2\pi}{3}$	**19**	$\frac{\pi}{4}$	**20**	i) $\left[\frac{\pi}{2},\frac{3\pi}{2}\right]$ ii) $\frac{\pi}{3}$ $iii)[0,2]to\ [-\pi,\pi]$		