CHAPTER-2

INVERSE TRIGONOMETRIC FUNCTIONS

ASSERTION REASON QUESTIONS

The following questions consist of two statements – Assertions (A) and Reason(R). Answer these questions selecting the appropriate option given below:

(a) Both A and R are true and R is the correct explanation for A

(b) Both A and R are true and R is not the correct explanation for A

(c) A is true but R is false

(d) A is false but R is true

1.	Assertion(A): $\tan^{-1} x + \tan^{-1} \frac{1}{x} = \pi$. Reason(R) : $\tan^{-1} x + \cot^{-1} x = \frac{\pi}{2}$, $\forall\, x \in R$.
2.	Assertion (A): $\sin^{-1}[\sin \frac{33\pi}{7}] = \frac{2\pi}{7}$. Reason(R) : $\sin^{-1}[\sin x] = x$, $\forall\, x \in [-\frac{\pi}{2}, \frac{\pi}{2}]$.
3.	Assertion (A): The domain of the function $\csc^{-1} x$ is $R - (-1, 1)$. Reason(R) : The range of $\csc^{-1} x$ is $[-\frac{\pi}{2}, \frac{\pi}{2}] - \{0\}$.
4.	Assertion (A): If $0 \le x \le \frac{\pi}{2}$, then $\sin^{-1}(cosx) + \cos^{-1}(sinx) = \pi - 2x$. Reason(R) : $\cos^{-1} x = \frac{\pi}{2} - \sin^{-1} x$, $\forall\, x \in [-1, 1]$.
5.	Assertion(A): The value of $\tan(\sin^{-1} \frac{3}{5} + \cot^{-1} \frac{3}{2}) = \frac{17}{6}$. Reason(R) : $\tan^{-1}(tanx) = \pi - x$, $\forall\, x \in R$.
6.	.Assertion: $\sin^{-1}(\sin 2\pi/3) = \pi/3$ Reason: $\sin^{-1}(\sin \theta) = \theta$ *when* $\theta \in [-\pi/2, \pi/2]$
7.	Assertion: $\cos^{-1}x + \cos^{-1}y = \cos^{-1}(xy - \sqrt{1-x^2}\sqrt{1-y^2})$ If x, y >0 and $x^2 + y^2 \le 1$ Reason : $\cos(\cos^{-1} x) = x$ when $x \in [-1,1]$
8.	Assertion : $\tan^{-1} 2 + \tan^{-1} 3 = 3\pi/4$ Reason: $\tan^{-1} x + \tan^{-1} y = \tan^{-1} (\frac{x+y}{1-xy})$

9.	Assertion: $\cot^{-1}(-x) = \pi - \cot^{-1} x$ Reason :The range of $\cot^{-1} x$ is $(0, \pi$
10	Assertion: Equations $2\sin^{-1} x + 3\sin^{-1} y = 5\pi/2$ and $y = kx - 5$ hold simultaneously When k is equal to 6. Reason: $\text{Sin}^{-1} x$ is continuous function in $x \in R$.
11	Assertion : The equation $2(\sin^{-1}x)^2-5(\sin^{-1}x+2)=0$ Reason : $\sin^{-1}(\sin x)=x$ if $x\in [-1.57,1.57]$
12	Assertion :The number of solutions of the Equation $\sin^{-1}x+\sin^{-1}2x=\frac{\pi}{3}$ is only one. Reason: The sum of two positive angles cannot be negative.
13	Assertion (A): Principal value of $\cos^{-1}(1)$ is π Reason (R): Value of $\cos 0^0$ is 1
14	Assertion (A): Range of $\cot^{-1} x$ is $(0,\pi)$ Reason (R): Domain of $\tan^{-1} x$ is R.
15	Assertion: Principle value of $\cos^{-1} 1 = 0°$ Reason: $\cos 0° = 1.$
16	Assertion:$\tan 1$ is less than $\tan^{-1} 1$ Reason: Both the functions tan and $\tan^{-1}$are increasing in first quadrant.
17	Assertion:$\tan^{-1}(-1) = -\frac{\pi}{4}$ Reason:$\tan^{-1}(-\theta) = -\tan\theta$for $\theta \in (-\frac{\pi}{2}, \frac{\pi}{2})$.
18	Assertion:$\cos^{-1}(-\frac{1}{2}) = \frac{2\pi}{3}$ Reason:$\cos^{-1}(-x) = \pi - \cos^{-1} x.$
19	Assertion (A): The domain of the function $\sec^{-1}x$ is the set of all real numbers. Reason(R): For the function $\sec^{-1}x$, x can take all real values except in the interval (-1, 1)
20	Assertion (A): To define the inverse of the function f(x) = tan x any of the intervals $(-3\pi/2, -\pi/2)$, $(-\pi/2, \pi/2)$, $(\pi/2, 3\pi/2)$ etc. can be chosen. Reason(R): The branch having range $(-\pi/2, \pi/2)$ is called principal value branch of the function $g(x) = \tan^{-1}x$.

21	Assertion(A): $\sin^{-1}(\sin 3) = 3$ Reason(R): For principal values $\sin^{-1}(\sin x) = x$
22	Assertion: The principal value of $\cos^{-1}\left(\cos\frac{5\pi}{3}\right)$ is $\frac{\pi}{3}$ Reason: The range of $\cos^{-1} x$ is $[0,\pi]$
23	Assertion: The value of $\tan^{-1}\sqrt{3} - \sec^{-1}(-2)$ is $\frac{\pi}{3}$ Reason: The range of $\cos^{-1} x$ is $[0,\pi]$
24	Assertion: The principal value of $\tan^{-1} tan\frac{3\pi}{4}$ is $-\frac{\pi}{4}$ Reason: The of range $\tan^{-1}x$ is $(-\frac{\pi}{2},\frac{\pi}{2})$
25	Assertion: If $\sin^{-1} x - \cos^{-1} x = \frac{\pi}{6}$, then x is $\frac{\pi}{3}$ Reason: The of range $\tan^{-1}x$ is $[-\frac{\pi}{2},\frac{\pi}{2}]$
26	Assertion: The principal value of $\cos^{-1}(\sec^{-1}\frac{5}{3})$ is $\frac{3}{5}$ Reason: The value of $\sec^{-1} x$ is $\cos^{-1}\frac{1}{x}$.
27	Assertion (A): If $\cos^{-1} x - \sin^{-1} x = 0$, then $x=\frac{1}{\sqrt{2}}$ Reason (R) : $\cos^{-1} x + \sin^{-1} x = \frac{\pi}{2}$
28	Assertion (A): $\cot(\frac{\pi}{2} - 2\cot^{-1}3) = 7$ Reason (R) : $\sin^{-1}\frac{4}{5} + 2\tan^{-1}\frac{1}{3} = \frac{\pi}{2}$
29	Assertion (A): $\tan^{-1}\frac{3}{4} + \tan^{-1}\frac{1}{7} = \frac{\pi}{4}$ Reason (R) : For all $x > 0, y > 0, xy < 1$, $\tan^{-1}x + \tan^{-1}y =$ $\tan^{-1}\frac{x+y}{1-xy}$
30	Assertion (A): $\sin^{-1}\frac{8}{17} + \sin^{-1}\frac{3}{5} = \sin^{-1}\frac{77}{85}$ Reason (R) : $\sin^{-1}x + \sin^{-1} y = \sin^{-1}(x\sqrt{1-y^2} + y\sqrt{1-x^2})$ For $-1 \leq x,y \leq 1, x^2+y^2 \leq 1$.
31	Assertion (A) : Domain of $\sin^{-1}(x)$ is $(-1, 1)$ Reason(R): The value of $\sin^{-1}(1)$ is $\pi/2$
32	Assertion (A): Range of $\sin^{-1}(x)$ is $[-\pi/2, \pi/2]$ Reason(R) : The principal value of $\sin^{-1}(1)$ is $\pi/2$

33	Assertion (A): The principal value of $\cot^{-1}\frac{1}{\sqrt{3}} = \pi/6$ Reason(R):Range of principal value branch of $\cot^{-1} x$is (0 , π)
34	Assertion (A) : The principal value of $\tan^{-1}\frac{1}{\sqrt{3}} = \pi/6$ Reason(R) : Range of principal value branch of tan−1 x is (0 , π)
35	Assertion (A) : Range of principal value branch of $\cot^{-1} x$ is (0 , π) Reason(R): Domain of $\sin^{-1}(x)$ is (−1 ,1).
36	A: Trigonometric functions are not invertible. R: Trigonometric functions are not one-one and onto in their domains.
37	A: If $x \in [1, \sqrt{3}]$, then the range of $f(x) = \tan^{-1} x$ is $\left[\frac{\pi}{4}, \frac{\pi}{3}\right]$. R: If $x \in [a, b]$, then the range of $f(x)$ is $[f(a), f(b)]$.
38	A: The function $f(x) = x^2 + \tan^{-1} x$ is a non-periodic function. R: The sum of two non-periodic functions is always non-periodic.
39	A: Domain of the function $f(x) = \cot^{-1} x$ is $\mathbb{R}$. R: $\cot x$ is defined for all $x \in \mathbb{R}$.
40	A: Value of $\cos^{-1}\left(\cos\frac{7\pi}{6}\right)$ is $\frac{5\pi}{6}$. R: Principal value branch of $\cos^{-1} x$ is $(0, \pi)$.

ANSWER KEY

Q.NO	ANS		Q.NO	ANS
1	d		21	d
2	a		22	a
3	b		23	d
4	a		24	c
5	c		25	b
6	a		26	a
7	a		27	a
8	c		28	b
9	a		29	a
10	c		30	a
11	a		31	d
12	a		32	a
13	d		33	d
14	b		34	c
15	d		35	b
16	a		36	a
17	a		37	c
18	a		38	c
19	d		39	c
20	b		40	a

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