

Inverse Trigonometric Functions

1. If x, y, z are in A.P. and $\tan^{-1}x, \tan^{-1}y$ and $\tan^{-1}z$ are also in A.P., then [JEE (Main)-2013]

- (1) $x = y = z$ (2) $2x = 3y = 6z$
 (3) $6x = 3y = 2z$ (4) $6x = 4y = 3z$

(1) $\frac{\sqrt{146}}{12}$ (2) $\frac{\sqrt{145}}{12}$

(3) $\frac{\sqrt{145}}{10}$ (4) $\frac{\sqrt{145}}{11}$

2. If $y = \sec(\tan^{-1} x)$, then $\frac{dy}{dx}$ at $x = 1$ is equal to [JEE (Main)-2013]

- (1) $\frac{1}{\sqrt{2}}$ (2) $\frac{1}{2}$
 (3) 1 (4) $\sqrt{2}$

3. Let $\tan^{-1}y = \tan^{-1}x + \tan^{-1}\left(\frac{2x}{1-x^2}\right)$

where $|x| < \frac{1}{\sqrt{3}}$. Then a value of y is

[JEE (Main)-2015]

- (1) $\frac{3x-x^3}{1-3x^2}$ (2) $\frac{3x+x^3}{1-3x^2}$
 (3) $\frac{3x-x^3}{1+3x^2}$ (4) $\frac{3x+x^3}{1+3x^2}$

4. Consider $f(x) = \tan^{-1}\left(\sqrt{\frac{1+\sin x}{1-\sin x}}\right), x \in \left(0, \frac{\pi}{2}\right)$

A normal to $y = f(x)$ at $x = \frac{\pi}{6}$ also passes through the point

[JEE (Main)-2016]

- (1) $\left(0, \frac{2\pi}{3}\right)$ (2) $\left(\frac{\pi}{6}, 0\right)$
 (3) $\left(\frac{\pi}{4}, 0\right)$ (4) (0, 0)

5. If $\cos^{-1}\left(\frac{2}{3x}\right) + \cos^{-1}\left(\frac{3}{4x}\right) = \frac{\pi}{2} \left(x > \frac{3}{4}\right)$, then x is equal to

[JEE (Main)-2019]

6. If $x = \sin^{-1}(\sin 10)$ and $y = \cos^{-1}(\cos 10)$, then $y - x$ is equal to [JEE (Main)-2019]

- (1) 7π (2) 10
 (3) 0 (4) π

7. The value of $\cot\left(\sum_{n=1}^{19} \cot^{-1}\left(1 + \sum_{p=1}^n 2p\right)\right)$ is

[JEE (Main)-2019]

- (1) $\frac{19}{21}$ (2) $\frac{23}{22}$
 (3) $\frac{22}{23}$ (4) $\frac{21}{19}$

8. All x satisfying the inequality $(\cot^{-1}x)^2 - 7(\cot^{-1}x) + 10 > 0$, lie in the interval [JEE (Main)-2019]

- (1) $(\cot 2, \infty)$
 (2) $(\cot 5, \cot 4)$
 (3) $(-\infty, \cot 5) \cup (\cot 4, \cot 2)$
 (4) $(-\infty, \cot 5) \cup (\cot 2, \infty)$

9. If $\alpha = \cos^{-1}\left(\frac{3}{5}\right)$, $\beta = \tan^{-1}\left(\frac{1}{3}\right)$, where $0 < \alpha$,

$\beta < \frac{\pi}{2}$, then $\alpha - \beta$ is equal to

[JEE (Main)-2019]

- (1) $\tan^{-1}\left(\frac{9}{14}\right)$ (2) $\cos^{-1}\left(\frac{9}{5\sqrt{10}}\right)$
 (3) $\sin^{-1}\left(\frac{9}{5\sqrt{10}}\right)$ (4) $\tan^{-1}\left(\frac{9}{5\sqrt{10}}\right)$

10. If $\cos^{-1}x - \cos^{-1}\frac{y}{2} = \alpha$, where $-1 \leq x \leq 1$, $-2 \leq y \leq 2$, then for all x, y , $4x^2 - 4xy \cos\alpha + y^2$

is equal to :

- (1) $2 \sin^2\alpha$ (2) $4 \sin^2\alpha - 2x^2y^2$
 (3) $4 \cos^2\alpha + 2x^2y^2$ (4) $4 \sin^2\alpha$

11. The value of $\sin^{-1}\left(\frac{12}{13}\right) - \sin^{-1}\left(\frac{3}{5}\right)$ is equal to

[JEE (Main)-2019]

- (1) $\frac{\pi}{2} - \sin^{-1}\left(\frac{56}{65}\right)$ (2) $\pi - \sin^{-1}\left(\frac{63}{65}\right)$
 (3) $\pi - \cos^{-1}\left(\frac{33}{65}\right)$ (4) $\frac{\pi}{2} - \cos^{-1}\left(\frac{9}{65}\right)$

12. If $f(x) = \tan^{-1}(\sec x + \tan x)$, $-\frac{\pi}{2} < x < \frac{\pi}{2}$, and $f(0) = 0$, then $f(1)$ is equal to [JEE (Main)-2020]

- (1) $\frac{\pi+1}{4}$ (2) $\frac{1}{4}$
 (3) $\frac{\pi+2}{4}$ (4) $\frac{\pi-1}{4}$

13. The domain of the function

$$f(x) = \sin^{-1}\left(\frac{|x|+5}{x^2+1}\right)$$

$(-\infty, -a] \cup [a, \infty)$. Then a is equal to

[JEE (Main)-2020]

- (1) $\frac{1+\sqrt{17}}{2}$ (2) $\frac{\sqrt{17}}{2} + 1$
 (3) $\frac{\sqrt{17}-1}{2}$ (4) $\frac{\sqrt{17}}{2}$

14. $2\pi - \left(\sin^{-1}\frac{4}{5} + \sin^{-1}\frac{5}{13} + \sin^{-1}\frac{16}{65}\right)$ is equal to

- (1) $\frac{\pi}{2}$ (2) $\frac{7\pi}{4}$
 (3) $\frac{3\pi}{2}$ (4) $\frac{5\pi}{4}$

15. If S is the sum of the first 10 terms of the series

$$\tan^{-1}\left(\frac{1}{3}\right) + \tan^{-1}\left(\frac{1}{7}\right) + \tan^{-1}\left(\frac{1}{13}\right) + \tan^{-1}\left(\frac{1}{21}\right) + \dots,$$

then $\tan(S)$ is equal to

[JEE (Main)-2020]

- (1) $-\frac{6}{5}$ (2) $\frac{5}{11}$
 (3) $\frac{10}{11}$ (4) $\frac{5}{6}$

16. The derivative of $\tan^{-1}\left(\frac{\sqrt{1+x^2}-1}{x}\right)$ with respect

to $\tan^{-1}\left(\frac{2x\sqrt{1-x^2}}{1-2x^2}\right)$ at $x = \frac{1}{2}$ is

- [JEE (Main)-2020]
- (1) $\frac{2\sqrt{3}}{3}$ (2) $\frac{2\sqrt{3}}{5}$
 (3) $\frac{\sqrt{3}}{10}$ (4) $\frac{\sqrt{3}}{12}$

17. If $y = \sum_{k=1}^6 k \cos^{-1}\left\{\frac{3}{5}\cos kx - \frac{4}{5}\sin kx\right\}$, then

$\frac{dy}{dx}$ at $x = 0$ is _____. [JEE (Main)-2020]