



MATHS

BOOKS - ARIHANT MATHS (HINGLISH)

INVERSE - TRIGONOMETRIC FUNCTIONS

Illustrative Examples

1. Evaluate $\tan^{-1} \sqrt{3} - \cot^{-1}(-\sqrt{3})$



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2. Find the value of $\cos^{-1}\left(\cos \frac{2\pi}{3}\right) + \sin^{-1}\left(\sin \frac{2\pi}{3}\right)$.



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3. $\tan^{-1}(\sqrt{3}) + \sec^{-1}(-2) =$

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4. Evaluate :

$$\tan^{-1}\left(2 \cos\left(2 \sin^{-1}\left(\frac{1}{2}\right)\right)\right)$$

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Frequently Asked Questions

1. $\cos\left(\sin^{-1}\left(\frac{3}{5}\right) + \cot^{-1}\left(\frac{3}{2}\right)\right) = \frac{6}{5\sqrt{13}}$

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2. If $\tan^{-1} x + \tan^{-1} y = \frac{\pi}{4}$, $xy < 1$, then prove that $x + y + xy = 1$.

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3. Prove that: $3 \sin^{-1} x = \sin^{-1}(3x - 4x^3)$, $x \in \left[-\frac{1}{2}, \frac{1}{2}\right]$

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4. If $\sin^{-1} x = \tan^{-1} y$ what is the value of $\frac{1}{x^2} - \frac{1}{y^2}$?

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5. Prove that $\cos^{-1} x + \cos^{-1} \left[\frac{x}{2} + \frac{\sqrt{3-3x^2}}{2} \right] = \frac{\pi}{3}$, $\frac{1}{2} \leq x \leq 1$

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6. Find the value of :

$$\sin\left(2 \tan^{-1} \frac{1}{4}\right) + \cos\left(\tan^{-1} 2\sqrt{2}\right)$$

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7. Prove that : $\tan^{-1}\left(\frac{1}{2}\right) + \tan^{-1}\left(\frac{1}{5}\right) + \tan^{-1}\left(\frac{1}{8}\right) = \frac{\pi}{4}$.

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8. Show that $\frac{\sin^{-1} 3}{5} - \frac{\sin^{-1} 8}{17} = \frac{\cos^{-1}(84)}{85}$.

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9. Prove that: $\sin^{-1}\left(\frac{5}{13}\right) + \cos^{-1}\left(\frac{4}{5}\right) = \frac{1}{2} \sin^{-1}\left(\frac{3696}{4225}\right)$

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10. Show that : $2 \sin^{-1} \left(\frac{3}{5} \right) - \tan^{-1} \left(\frac{17}{31} \right) = \frac{\pi}{4}$

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11. Prove that $\tan \left[\frac{\pi}{4} + \frac{1}{2} \cos^{-1} \frac{a}{b} \right] + \tan \left[\frac{\pi}{4} - \frac{1}{2} \cos^{-1} \frac{a}{b} \right] = 2 \frac{b}{a}$

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12.
$$\begin{aligned} \frac{9\pi}{8} - \frac{9}{4} \sin^{-1} \frac{1}{3} &= \frac{9}{4} \sin^{-1} \frac{2\sqrt{2}}{3} \\ \frac{9\pi}{8} - \frac{9}{4} \sin^{-1} \frac{1}{3} &= \frac{9}{4} \left(\frac{\pi}{2} - \sin^{-1} \frac{1}{3} \right) = \frac{9}{4} \cos^{-1} \frac{1}{3} \\ &= \frac{9}{4} \sin^{-1} \sqrt{1 - \left(\frac{1}{3} \right)^2} \quad \left(\because \cos^{-1} x = \sin^{-1} \sqrt{1 - x^2} \right) \\ &= \frac{9}{4} \sin^{-1} \sqrt{\frac{8}{9}} = \frac{9}{4} \sin^{-1} \left(\frac{2\sqrt{2}}{3} \right) = \text{RHS Hence Proved.} \end{aligned}$$

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13. Prove that

$$\tan^{-1}\left(\frac{6x - 8x^3}{1 - 12x^2}\right) - \tan^{-1}\left(\frac{4x}{1 - 4x^2}\right) = \tan^{-1} 2x; |2x| < \frac{1}{\sqrt{3}}$$

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14. Prove that

$$\tan^{-1} \frac{1}{5} + \tan^{-1} \frac{1}{7} + \tan^{-1} \frac{1}{8} = \frac{\pi}{4}$$

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15. Solve : $2 \tan^{-1}(\cos x) = \tan^{-1}(2 \cos ecx)$

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16. Solve : $\tan^{-1} 4x + \tan^{-1} 6x = \frac{\pi}{4}$

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17. If $\tan^{-1}\left(\frac{x-3}{x-4}\right) + \tan^{-1}\left(\frac{x+3}{x+4}\right) = \frac{\pi}{4}$,

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18. Solve :

(i) $\tan^{-1} \frac{x}{2} + \tan^{-1} \frac{x}{3} = \frac{\pi}{4}$, $\sqrt{6} > x > 0$

(ii) $\sin\left(\sin^{-1} \frac{1}{5} + \cos^{-1} x\right) = 1$

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19. If $(\tan^{-1} x)^2 + (\cot^{-1} x)^2 = \frac{5\pi^2}{8}$, then find x .

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20. Prove that $\tan^{-1}\left(\frac{\cos x}{1 + \sin x}\right) = \frac{\pi}{4} - \frac{x}{2}$, $x \in \left(-\frac{\pi}{2}, \frac{\pi}{2}\right)$

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21. Express $\sin^{-1}\left(\frac{\sin x + \cos x}{2}\right)$, where $-\frac{\pi}{4} < x < \frac{\pi}{4}$, in the simplest form.

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22. Prove that :

$$\tan^{-1} x + \tan^{-1} \frac{2x}{1-x^2} = \tan^{-1} \frac{3x-x^3}{1-3x^2}, |x| < \frac{1}{\sqrt{3}}$$

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23. Simplify $\tan^{-1}\left[\frac{a \cos x - b \sin x}{b \cos x + a \sin x}\right]$, if $\frac{a}{b} \tan x > 1$.

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24.

Prove

that:

$$\tan^{-1} \left[\frac{\sqrt{1+x} - \sqrt{1-x}}{\sqrt{1+x} + \sqrt{1-x}} \right] = \frac{\pi}{4} - \frac{1}{2} \cos^{-1} x, \quad -\frac{1}{\sqrt{2}} \leq x \leq 1$$

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25. Prove the following: $\cos [\tan^{-1} \{ \sin(\cos^{-1} x) \}] = \sqrt{\frac{1+x^2}{2+x^2}}$

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Questions From Ncert Exemplar

1. Prove that $\tan(\cot^{-1} x) = \cot(\tan^{-1} x)$

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2. Find the value of $\tan(\cos^{-1} x)$ and hence evaluate

$$\tan\left(\cos^{-1}\left(\frac{8}{17}\right)\right)$$

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3. Prove that : $\cot^{-1} 7 + \cot^{-1} 8 + \cot^{-1} 18 = \cot^{-1} 3$

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4. Find the value

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Exercise 2 A Short Answer Type Questions

1. Find the principal values of the following

$$\cos^{-1}\left(\cos. \frac{13\pi}{6}\right)$$

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2. Write the principal value of, $\cos^{-1}\left(\frac{\cos(7\pi)}{6}\right)$

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3. $\tan^{-2} \tan\left(\frac{3\pi}{4}\right)$

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4. Using principal value, evaluate the following: $\sin^{-1}\left(\frac{\sin(3\pi)}{5}\right)$

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5. Find the principal values of the following

$$\sin\left(\cos^{-1}\left(\frac{1}{2}\right)\right)$$

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6. $\cos\left(\sin^{-1}\left(\frac{5}{13}\right)\right) =$

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7. find the value of $\sin^{-1}\left(-\frac{1}{2}\right) + \cos^{-1}\left(-\frac{1}{2}\right)$

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8. Write the principal value of $\tan^{-1}(1) + \cos^{-1}\left(-\frac{1}{2}\right)$

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9. Write the principal value of $\tan^{-1} \sqrt{(3)} - \cot^{-1} \sqrt{(-3)}$.

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10. Write the principal value of :

$$\cos^{-1} \left(\frac{1}{2} \right) - 2 \sin^{-1} \left(-\frac{1}{2} \right)$$

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Exercise 2 A Long Answer Type Questions

1. Find the value of $\cos^{-1} \left(\frac{1}{2} \right) + 2 \sin^{-1} \left(\frac{1}{2} \right)$

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2. Find the value of : $\tan^{-1}\left(\frac{-1}{\sqrt{3}}\right) + \cos^{-1}\left(\frac{-\sqrt{3}}{2}\right) + \sin^{-1}\left(\frac{1}{2}\right)$

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3. Write the value of $\tan^{-1}\left[2 \sin\left(2 \frac{\cos^{-1}(\sqrt{3})}{2}\right)\right]$.

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Exercise 2 B Short Answer Type Questions

1. Find the value of each of the expression in Exercise 16 to 18:

$$\sin^{-1}\left(\sin \frac{2\pi}{3}\right)$$

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2. Write the value of $\sin^{-1}\left(\sin. \frac{3\pi}{5}\right)$.

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3. Find the value of the following :

$$\sin^{-1}\left(\sin. \frac{4\pi}{5}\right)$$

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4. $\tan^{-2} \tan\left(\frac{3\pi}{4}\right)$

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5. Find the value of the following: $\tan^{-1}\left(\frac{\tan(7\pi)}{6}\right)$

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6. Find the value of the following :

$$\tan\left(2 \tan^{-1} \frac{1}{5}\right)$$

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7. Evaluate: $\cos(\sec^{-1} x + \operatorname{cosec}^{-1} x)$, $|x| \geq 1$

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8. Find the value of the following expression:

$$\cot(\tan^{-1} a + \cot^{-1} a)$$

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9. Evaluate

(i) $\sin\left[\left(\frac{\pi}{3} - \sin^{-1}\left(-\frac{1}{2}\right)\right)\right]$

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10. Prove that : $2 \sin^{-1} \frac{3}{5} = \tan^{-1} \frac{24}{7}$

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11. Show that: $\tan\left(\frac{1}{2} \sin^{-1} \frac{3}{4}\right) = \frac{4\sqrt{-7}}{3}$

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12. Prove that :

$$\tan^{-1} \frac{3}{5} + \tan^{-1} \frac{1}{4} = \frac{\pi}{4}$$

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13. Prove that :

$$\cos^{-1}(\cos^2 x - \sin^2 x) = 2x$$

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14. Prove that: $3 \cos^{-1} x = \cos^{-1}(4x^3 - 3x)$, $x \in \left[\frac{1}{2}, 1\right]$

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15. Prove that :

$$\sin^{-1}\left(2x\sqrt{1-x^2}\right) = 2\sin^{-1}x, \quad -\frac{1}{\sqrt{2}} \leq x \leq \frac{1}{\sqrt{2}}$$

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16. Prove that :

$$\sin^{-1}\left(2x\sqrt{1-x^2}\right) = 2\sin^{-1}x, \quad -\frac{1}{\sqrt{2}} \leq x \leq \frac{1}{\sqrt{2}}$$

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17. Prove that :

$$2 \sin^{-1} \left(\frac{2x}{1+x^2} \right), \quad -1 \leq x < 1$$

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18. Prove that :

$$\tan^{-1} \left(\frac{2x\sqrt{1-x^2}}{1-2x^2} \right) = 2 \sin^{-1} x \text{ when : } -\frac{1}{\sqrt{2}} \leq x \leq \frac{1}{\sqrt{2}}$$

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19. Prove that: $\tan^{-1} \sqrt{x} = \frac{1}{2} \cos^{-1} \left(\frac{1-x}{1+x} \right), x \in [0, 1]$

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20. Prove that

$$\tan^{-1} \left(\frac{1 - \sqrt{x}}{1 + \sqrt{x}} \right) = \frac{\pi}{4} - \tan^{-1} \sqrt{x}, \text{ where } x > 0$$

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21. Evaluate $\sin^{-1} \frac{4}{5} + \sin^{-1} \frac{5}{13} + \sin^{-1} \frac{16}{65}$

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22. Prove that: $\frac{\sin^{-1}(12)}{13} + \frac{\cos^{-1} 4}{5} + \frac{\tan^{-1}(63)}{16} = \pi$

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23. Prove that : $\tan^{-1} 1 + \tan^{-1} 2 + \tan^{-1} 3 = \pi$

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24. Prove that

$$\tan^{-1} \cdot \frac{1}{2} + \tan^{-1} \cdot \frac{2}{11} = \tan^{-1} \cdot \frac{3}{4}$$

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25. Prove that: $2 \frac{\tan^{-1} 1}{2} + \frac{\tan^{-1} 1}{7} = \frac{\tan^{-1}(31)}{17}$

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26. Prove that

$$2 \tan^{-1} \cdot \frac{1}{5} + \tan^{-1} \cdot \frac{1}{4} = \tan^{-1} \cdot \frac{32}{43}$$

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27. Prove that

$$2 \tan^{-1} \cdot \frac{1}{5} + \tan^{-1} \cdot \frac{1}{6} = \tan^{-1} \cdot \frac{9}{13}$$

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28. Prove that

$$2 \tan^{-1} \frac{1}{7} + \tan^{-1} \frac{1}{3} = \tan^{-1} \frac{9}{13}$$

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29. Prove that

$$\tan^{-1} \frac{1}{2} + \tan^{-1} \frac{1}{5} = \frac{1}{2} \cos^{-1} \frac{16}{65}$$

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30. Prove that: $\tan^{-1} \left(\frac{1}{4} \right) + \tan^{-1} \left(\frac{2}{9} \right) = \frac{1}{2} \cos^{-1} \left(\frac{3}{5} \right)$.

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31. Prove that

$$\tan^{-1} \frac{3}{4} + \tan^{-1} \frac{3}{5} - \tan^{-1} \frac{8}{19} = \frac{\pi}{4}$$

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32. Prove that

$$\tan^{-1} \frac{1}{5} + \tan^{-1} \frac{1}{7} + \tan^{-1} \frac{1}{8} = \frac{\pi}{4}$$

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33. Prove that

$$\tan^{-1} \frac{1}{5} + \tan^{-1} \frac{1}{7} + \tan^{-1} \frac{1}{8} = \frac{\pi}{4}$$

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34. Prove that $\cos^{-1} \frac{4}{5} + \cos^{-1} \frac{12}{13} = \cos^{-1} \frac{33}{65}$

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35. $\cos^{-1}\left(\frac{12}{13}\right) + \sin^{-1}\left(\frac{3}{5}\right) =$

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36. Prove that $\sin^{-1}\left(\frac{63}{65}\right) = \sin^{-1}\left(\frac{5}{13}\right) + \cos^{-1}\left(\frac{3}{5}\right)$

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37. Prove that

$$\sin^{-1} \cdot \frac{8}{17} + \sin^{-1} \cdot \frac{3}{5} = \sin^{-1} \cdot \frac{77}{85}$$

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38. Prove that

$$\sin^{-1} \frac{8}{17} + \cos^{-1} \frac{4}{5} = \cot^{-1} \left(\frac{36}{77} \right)$$

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39. Prove that

$$\sin^{-1} \frac{8}{17} + \cos^{-1} \frac{4}{5} = \cos^{-1} \frac{36}{85}$$

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40. Prove that $2 \sin^{-1} \left[\frac{3}{5} \right] - \tan^{-1} \left[\frac{17}{31} \right] = \frac{\pi}{4}$

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41. Prove that $2 \sin^{-1} \left[\frac{3}{5} \right] - \tan^{-1} \left[\frac{17}{31} \right] = \frac{\pi}{4}$

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42. Prove that

$$\sin^{-1} \frac{3}{5} + \cos^{-1} \frac{12}{13} = \sin^{-1} \frac{56}{65}$$

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43. Prove that

$$\sin^{-1} \frac{3}{5} - \sin^{-1} \frac{8}{17} = \cos^{-1} \frac{84}{85}$$

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$$44. \cos^{-1} \left(\frac{4}{5} \right) + \tan^{-1} \left(\frac{3}{5} \right) = \tan^{-1} \left(\frac{27}{11} \right)$$

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$$45. \text{ Prove that : } \frac{\tan^{-1}(63)}{16} = \frac{\sin^{-1} 5}{13} + \frac{\cos^{-1} 3}{5}$$

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46. Prove that: $\sin^{-1}\left(\frac{3}{5}\right) + \cos^{-1}\left(\frac{5}{\sqrt{26}}\right) = \tan^{-1}\left(\frac{19}{17}\right)$

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47. Find the value of :

$$4\left(2 \tan^{-1} \cdot \frac{1}{3} + \tan^{-1} \cdot \frac{1}{7}\right)$$

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48. Prove that: $2 \frac{\tan^{-1} 1}{5} + \frac{\sec^{-1}(5\sqrt{2})}{7} + 2 \tan^{-1} \frac{1}{8} = \frac{\pi}{4}$

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49. Find the value of $\tan^{-1}\left(\frac{x}{y}\right) - \tan^{-1}\left(\frac{x-y}{x+y}\right)$

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50. Prove that:

$$\cot^{-1}\left(\frac{ab+1}{a-b}\right) + \cot^{-1}\left(\frac{bc+1}{b-c}\right) + \cot^{-1}\left(\frac{ca+1}{c-a}\right) = 0.$$

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51. Find the value of

$$\tan\left\{\frac{1}{2}\sin^{-1}\left(\frac{2x}{1+x^2}\right) + \frac{1}{2}\cos^{-1}\left(\frac{1-y^2}{1+y^2}\right)\right\}$$

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52. Prove that

$$\tan\left[\frac{\pi}{4} + \frac{1}{2}\cos^{-1}\frac{a}{b}\right] + \tan\left[\frac{\pi}{4} - \frac{1}{2}\cos^{-1}\frac{a}{b}\right] = 2\frac{b}{a}$$

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53. Solve $\tan^{-1} 2x + \tan^{-1} 3x = \frac{\pi}{4}$.

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54. Solve $\tan^{-1}\left(\frac{x+1}{x-1}\right) + \tan^{-1}\left(\frac{x-1}{x}\right) = \tan^{-1}(-7)$

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55. Solve: $\frac{\tan^{-1}(x-1)}{x-2} + \frac{\tan^{-1}(x+1)}{x+2} = \frac{\pi}{4}$

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56. Solve $\sin^{-1}(1-x) - 2\sin^{-1}x = \frac{\pi}{2}$

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57. Solve for x : $2 \tan^{-1}(\sin x) = \tan^{-1}(2 \sec x)$, $x \neq \frac{\pi}{2}$

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58. Solve : $2 \tan^{-1}(\cos x) = \tan^{-1}(2 \sec x)$

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59. Solve the following equations :

$$\tan^{-1}(x + 2) + \tan^{-1}(x - 2) = \tan^{-1}\left(\frac{8}{79}\right)$$

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60. Solve the following equations :

$$\tan^{-1}(x + 1) + \tan^{-1}(x - 1) = \tan^{-1}\left(\frac{8}{31}\right), x > 0$$

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61. Solve the following equations :

$$\tan^{-1}(x + 2) + \tan^{-1}(x - 2) = \frac{\pi}{4}, x > 0$$

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62. If $\tan^{-1}\left(\frac{1-x}{1+x}\right) = \frac{1}{2}\tan^{-1}x, x > 0$, then $x = ?$

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63. Solve the following equations :

$$\tan^{-1} \cdot \frac{2x}{1-x^2} + \cos^{-1} \cdot \frac{1-x^2}{2x} = \frac{\pi}{3}, x > 0$$

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64. Solve the following equations :

$$\cos(\tan^{-1} x) = \sin\left(\cot^{-1} \frac{3}{4}\right)$$

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65. If $\sin(\cot^{-1}(x + 1)) = \cos \tan^{-1} x$, then $x =$

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66. Solve the following equations :

$$2 \tan^{-1}(\sin x) = \tan^{-1}(2 \sec x), 0 < x < \frac{\pi}{2}$$

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67. Solve the following equations :

$$\cos(\sin^{-1} x) = \frac{1}{2}$$

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68. Solve the following equations :

$$\tan^{-1}\left(\frac{x-2}{x-4}\right) + \tan^{-1}\left(\frac{x+2}{x+4}\right) = \frac{\pi}{4}$$

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69. Solve for x ,

$$\tan^{-1}(x+1) + \tan^{-1}x + \tan^{-1}(x-1) = \tan^{-1}3$$

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70. Solve for x :

$$3 \sin^{-1}\left(\frac{2x}{1+x^2}\right) - 4 \cos^{-1}\left(\frac{1-x^2}{1+x^2}\right) + 2 \tan^{-1}\left(\frac{2x}{1-x^2}\right) = \frac{\pi}{2}$$

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71. Express each of the following in the simplest form: $\tan^{-1}\left\{\frac{\cos x}{1-\sin x}\right\}, \pi/2$

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72. Write the following function in the simplest form: $\tan^{-1}\left(\frac{\cos x - \sin x}{\cos x + \sin x}\right), x$

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73. Write the following function in the simplest form: $\tan^{-1}\left(\frac{\cos x - \sin x}{\cos x + \sin x}\right), x$

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74. Write the following functions in the simplest form: $\tan^{-1}\left\{\frac{x}{a^2-x^2}\right\}, -a$

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75. Write the following function in the simplest form:

$$\frac{\tan^{-1}\left(\sqrt{1+x^2}-1\right)}{x}, x \neq 0$$

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76. Write the following in the simplest form :

$$\tan^{-1}\left(\frac{\sqrt{1-x^2}}{1+x}\right) = \frac{1}{2}\cos^{-1}x$$

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77. Prove that :

$$\tan^{-1}\left(\frac{\sqrt{1-x^2}}{1+x}\right) = \frac{1}{2}\cos^{-1}x$$

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78. prove that $\frac{1}{2}\tan^{-1} x = \cos^{-1} x \sqrt{\frac{1 + \sqrt{1 + x^2}}{2\sqrt{1 + x^2}}}$

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79. Prove that :

$$\tan^{-1} \left[\frac{\sqrt{1+z} + \sqrt{1-z}}{\sqrt{1+z} - \sqrt{1-z}} \right] = \frac{\pi}{4} + \frac{1}{2} \cos^{-1} z$$

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

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81. Prove that :

$$\cot^{-1} \left(\frac{\sqrt{1+x} - \sqrt{1-x}}{\sqrt{1+x} + \sqrt{1-x}} \right) = \frac{\pi}{4} + \frac{1}{2} \cos^{-1} x$$

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82. $\cot^{-1} \left(\frac{\sqrt{1+\sin x} + \sqrt{1-\sin x}}{\sqrt{1+\sin x} - \sqrt{1-\sin x}} \right) = \frac{x}{2}$

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83. If $\tan^{-1} x + \tan^{-1} y - \tan^{-1} z = 0$, then prove that :

$$x + y + xyz = z.$$

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84. If (i) $\cos^{-1} x + \cos^{-1} y + \cos^{-1} z = \pi$, prove that :

$$x^2 + y^2 + z^2 + 2xyz = 1$$

(ii) If $\sin^{-1} x + \sin^{-1} y + \sin^{-1} z = \frac{\pi}{2}$, prove that :

$$x^2 + y^2 + z^2 + 2xyz = 1$$

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85. Prove that: $\sin[\cot^{-1}\{\cos(\tan^{-1} x)\}] = \sqrt{\frac{x^2 - 1}{x^2 + 2}}$

$$\cos[\tan^{-1}\{\sin(\cot^{-1} x)\}] = \sqrt{\frac{x^2 + 1}{x^2 + 2}}$$

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Exercise 2 B Long Answer Type Questions II

1. If $\tan^{-1} \frac{yz}{xr} + \tan^{-1} \frac{zx}{yr} + \tan^{-1} \frac{xy}{zr} = \frac{\pi}{2}$, prove that ,

$$x^2 + y^2 + z^2 + r^2$$

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2. If $\cos^{-1}\left(\frac{x}{a}\right) + \cos^{-1}\left(\frac{y}{b}\right) = \alpha$

show that : $\frac{x^2}{a^2} - \frac{2xy}{ab}\cos \alpha + \frac{y^2}{b^2} = \sin^2 \alpha$.



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Objective Type Questions A Multiple Choice Questions

1. If $\sin^{-1} x = y$, then

A. $0 \leq y \leq \pi$

B. $-\frac{\pi}{2} \leq y \leq \frac{\pi}{2}$

C. $0 < y < \pi$

D. $-\frac{\pi}{2} < y < \frac{\pi}{2}$

Answer: B



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2. $\tan^{-1}(\sqrt{3}) + \sec^{-1}(-2) =$

A. π

B. $-\frac{\pi}{3}$

C. $\frac{\pi}{3}$

D. $\frac{2\pi}{3}$

Answer: B



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3. $\cos^{-1}\left(\cos\left(\frac{7\pi}{6}\right)\right)$ is equal to

A. $\frac{7\pi}{6}$

B. $\frac{5\pi}{6}$

C. $\frac{\pi}{3}$

D. $\frac{\pi}{6}$

Answer: B

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4. $\sin\left(\frac{\pi}{3} - \sin^{-1}\left(-\frac{1}{2}\right)\right)$ is equal to (A) $\frac{1}{2}$ (B) $\frac{1}{3}$ (C) $\frac{1}{4}$ (D) 1

A. $\frac{1}{2}$

B. $\frac{1}{3}$

C. $\frac{1}{4}$

D. 1

Answer: D

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5. $\tan^{-1} \sqrt{3} - \cot^{-1}(-\sqrt{3})$ is equal to

A. π

B. $-\frac{\pi}{2}$

C. 0

D. $2\sqrt{3}$

Answer: B

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6. $\sin(\tan^{-1} x)$, $|x| \leq 1$ is equal to :

A. $\frac{x}{\sqrt{1-x^2}}$

B. $\frac{1}{\sqrt{1-x^2}}$

C. $\frac{1}{\sqrt{1+x^2}}$

D. $\frac{x}{\sqrt{1+x^2}}$

Answer: D

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7. $\sin^{-1}(1-x) - 2\sin^{-1}x = \frac{\pi}{2}$, then x is equal to

A. $0, \frac{1}{2}$

B. $1, \frac{1}{2}$

C. 0

D. $\frac{1}{2}$

Answer: C

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8. $\tan^{-1}\left(\frac{x}{y}\right) - \frac{\tan^{-1}(x-y)}{x+y}$ is equal to (A) $\frac{\pi}{2}$ (B) $\frac{\pi}{3}$ (C) $\frac{\pi}{4}$ (D) $-\frac{3\pi}{4}$

A. $\frac{\pi}{2}$

B. $\frac{\pi}{3}$

C. $\frac{\pi}{4}$

D. $-\frac{3\pi}{4}$

Answer: C

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9. The value of $\sin^{-1}\left(\cos\left(\frac{43\pi}{5}\right)\right)$ is :

A. $\frac{3\pi}{5}$

B. $\frac{-7\pi}{5}$

C. $\frac{\pi}{10}$

D. $\frac{-\pi}{10}$

Answer: D



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10. The principal value of the expression : $\cos^{-1}[\cos(-680^\circ)]$ is :

A. $\frac{2\pi}{9}$

B. $\frac{-2\pi}{9}$

C. $\frac{34\pi}{9}$

D. $\frac{\pi}{9}$

Answer: A



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11. The value of $\cot(\sin^{-1} x)$ is :

A. $\sqrt{1 + \frac{x^2}{x}}$

B. $\frac{x}{\sqrt{1 + x^2}}$

C. $\frac{1}{x}$

D. $\frac{\sqrt{1 - x^2}}{x}$

Answer: D



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12. The domain of $\sin^{-1} 2x$ is :

A. $[0, 1]$

B. $[-1, 1]$

C. $\left[\frac{-1}{2}, \frac{1}{2}\right]$

D. $[-2, 2]$

Answer: C



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13. the greatest and least values of $(\sin^{-1} x)^2 + (\cos^{-1} x)^2$

A. $\frac{5\pi^2}{4}$ and $\frac{\pi^2}{8}$

B. $\frac{\pi}{2}$ and $\frac{-\pi}{2}$

C. $\frac{\pi^2}{4}$ and $\frac{-\pi^2}{4}$

D. $\frac{\pi^2}{4}$ and 0

Answer: A



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14. The principal value of $\sin^{-1}\left(\frac{1}{2}\right)$ is

A. $\frac{\pi}{6}$

B. $\frac{\pi}{4}$

C. $\frac{\pi}{3}$

D. $\frac{\pi}{2}$

Answer: A



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15. $\tan^{-1} \sqrt{3} - \cot^{-1}(-\sqrt{3})$ is equal to (A) π (B) $-\frac{\pi}{2}$ (C) 0 (D) $2\sqrt{3}$

A. π

B. $-\frac{\pi}{2}$

C. 0

D. $2\sqrt{3}$

Answer: B



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16. $\cos^{-1}\left(\cos\left(\frac{7\pi}{6}\right)\right)$ is equal to

A. $\frac{7\pi}{6}$

B. $\frac{5\pi}{6}$

C. $\frac{\pi}{3}$

D. $\frac{\pi}{6}$

Answer: B



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17. $\sin\left(\frac{\pi}{3} - \sin^{-1}\left(-\frac{1}{2}\right)\right)$ is equal to (A) $\frac{1}{2}$ (B) $\frac{1}{3}$ (C) $\frac{1}{4}$ (D) 1

A. $\frac{1}{2}$

B. $\frac{1}{3}$

C. $\frac{1}{4}$

D. 1

Answer: D

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18. $\sin\left(\frac{\pi}{3} - \sin^{-1}\left(-\frac{1}{2}\right)\right)$ is equal to

A. 1

B. $\frac{1}{2}$

C. $\frac{1}{\sqrt{2}}$

D. 0

Answer: A

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19. Find the principal value of: $\sin^{-1}\left(-\frac{1}{2}\right)$

A. $-\frac{\pi}{3}$

B. $-\frac{\pi}{6}$

C. $-\frac{\pi}{4}$

D. None of these

Answer: B



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20. If $\cos^{-1} x = y$ then :

A. $-\frac{\pi}{2} \leq y \leq \frac{\pi}{2}$

B. $-\pi \leq y \leq \pi$

C. $0 \leq y \leq \frac{\pi}{2}$

D. $0 \leq y \leq \pi$

Answer: D



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21. Find the principal value of $\sin^{-1}\left(\frac{1}{\sqrt{2}}\right)$

A. $\frac{\pi}{6}$

B. $\frac{\pi}{2}$

C. $\frac{\pi}{3}$

D. $\frac{\pi}{4}$

Answer: D



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22. The value of $\sin\left(\frac{\cos^{-1} 3}{5}\right)$ is

A. $\frac{4}{5}$

B. $\frac{3}{5}$

C. $\frac{2}{5}$

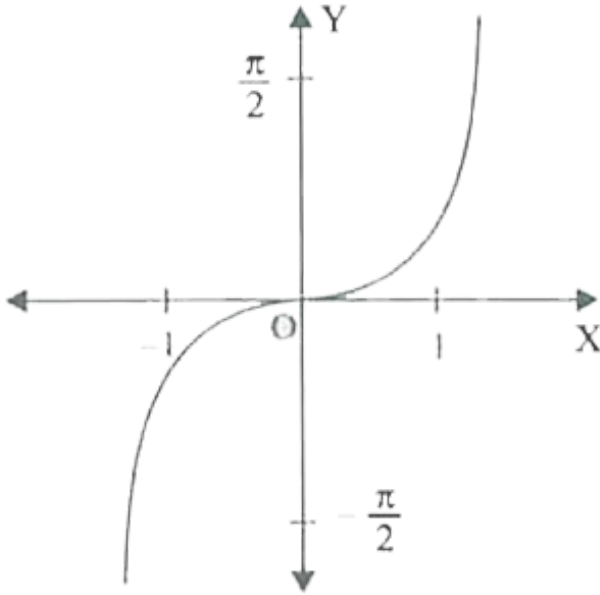
D. None of these

Answer: A



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23. Identify the function from the following figure :



A. $\tan^{-1} x$

B. $\sin^{-1} x$

C. $\cos^{-1} x$

D. $\operatorname{cosec}^{-1} x$

Answer: B



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24. Find the principal value of $\cot^{-1}\left(\frac{-1}{\sqrt{3}}\right)$.

A. $\frac{\pi}{6}$

B. $\frac{\pi}{4}$

C. $\frac{2\pi}{3}$

D. π

Answer: C



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25. Principal value of $\cos^{-1}\left[\cos\left(\frac{4\pi}{3}\right)\right]$ is

A. $\frac{4\pi}{5}$

B. $\frac{2\pi}{3}$

C. 0

D. π

Answer: B



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26. The principle value of $\sin^{-1}\left(\sin \frac{2\pi}{3}\right)$ is

A. $\frac{2\pi}{3}$

B. $\frac{\pi}{3}$

C. $-\frac{\pi}{3}$

D. $-\frac{2\pi}{3}$

Answer: B



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Objective Type Questions B Fill In The Blanks

1. Find the principal value of: $\sin^{-1}\left(-\frac{1}{2}\right)$

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2. Find the principal value of $\sin^{-1}\left(-\frac{1}{\sqrt{2}}\right)$.

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3. The principal value of $\cos^{-1}\left(-\frac{1}{2}\right)$ is

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4. The principal value of $\tan^{-1}\left(-\sqrt{3}\right)$ is

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5. Find the principal value of $\tan^{-1}(1)$

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6. Principal value of $\cot^{-1}(\sqrt{3})$ is _____

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7. The principal value of $\operatorname{cosec}^{-1}(-\sqrt{2})$ is

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8. $\sin^{-1} x + \cos^{-1} x = ?$

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9. $\tan^{-1} x + \cot^{-1} x =$ _____

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10. $\sec^{-1} x + \operatorname{cosec}^{-1} x$ _____

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Objective Type Questions C True False Questions

1. $2 \tan^{-1} x = \tan^{-1} \frac{2x}{1-x^2}$

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2. $2 \tan^{-1} x = \sin^{-1} \left(\frac{2x}{1+x^2} \right), 1 \leq x \leq 1$

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3. $\sin^{-1} x + \cos^{-1} x = \frac{\pi}{4}$

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4. Is $\sec^{-1}(-x) = \pi - \sec^{-1} x, |x| \geq 1$?

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5. Is $\cot^{-1}(-x) = \pi - \cot^{-1} x, x \in R$

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6. $\tan^{-1} \frac{3}{5} + \tan^{-1} \frac{1}{4} = \frac{\pi}{2}$

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1. Find the principal value of the following

(i) $\sin^{-1} \frac{1}{2}$

(ii) $\tan^{-1} \frac{1}{\sqrt{3}}$

(iii) $\cot^{-1}(-\sqrt{3})$

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2. Find the principal values of the following :

$$\sin^{-1} \left(\frac{1}{\sqrt{2}} \right)$$

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3. Find the principal values of the following :

$$\sin^{-1} \left(-\frac{\sqrt{3}}{2} \right)$$

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4. Find the principal value of each of the following:

i) $\cos^{-1}\left(-\frac{1}{\sqrt{2}}\right)$, ii) $\cos^{-1}\left(-\frac{1}{2}\right)$, iii) $\cot^{-1}\left(-\frac{1}{\sqrt{3}}\right)$

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5. Find the principal value of each of the following: $\cos^{-1}\left(-\frac{\sqrt{3}}{2}\right)$

(ii) $\cos^{-1}\left(-\frac{1}{\sqrt{2}}\right)$

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6. Find the principal value of each of the following:

i) $\cos^{-1}\left(-\frac{1}{\sqrt{2}}\right)$, ii) $\cos^{-1}\left(-\frac{1}{2}\right)$, iii) $\cot^{-1}\left(-\frac{1}{\sqrt{3}}\right)$

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7. Find the principal values of the following :

$$\tan^{-1}(-1)$$

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8. Find the principal values of the following :

$$\tan^{-1}(-\sqrt{3})$$

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9. Find the principal values of each of the following: $\cot^{-1}\left(-\frac{1}{\sqrt{3}}\right)$

(ii) $\cot^{-1}\left(\frac{\tan(3\pi)}{4}\right)$

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10. Find the principal values of each of the following: $\cot^{-1}(-\sqrt{3})$

(ii) $\cot^{-1}(\sqrt{3})$



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11. Find the principal values of the following :

$\sec^{-1}(-2)$



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12. Find the principal values of the following :

$\sec^{-1}\left(\frac{2}{\sqrt{3}}\right)$



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13. Find the principal value of the following:

(i) $\operatorname{cosec}^{-1}(2)$ (ii) $\tan^{-1}(-\sqrt{3})$ (iii) $\cos^{-1}\left(-\frac{1}{\sqrt{2}}\right)$

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14. Find the principal values of the following :

$\operatorname{cosec}^{-1}(-\sqrt{2})$

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15. If $\sin^{-1}\left(\frac{1}{3}\right) + \cos^{-1}x = \frac{\pi}{2}$, then $f \in dx$.

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16. If $\sec^{-1}(2) + \operatorname{cosec}^{-1}(y) = \frac{\pi}{2}$, then find y .

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17. Write down the domain of :

(i) $f(x) = \sin^{-1} x$

(ii) $f(x) = \cos^{-1} x$

(iii) $f(x) = \tan^{-1} x$

(iv) $f(x) = \sec^{-1} x$

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18. Write down the range of :

(i) $f(x) = \cos^{-1} x$

(ii) $f(x) = \cot^{-1} x$

(iii) $f(x) = \operatorname{cosec}^{-1} x$

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19. Write down the value of $\operatorname{cosec}^{-1}x + \sec^{-1}x$, when $x \geq 1$.

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20. If $4\sin^{-1}x + \cos^{-1}x = \pi$, then: $x =$

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21. Evaluate $\tan^{-1}1 + \cos^{-1}\frac{1}{3} + \sin^{-1}\frac{1}{3}$

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22. $\sec^2(\tan^{-1}2) + \operatorname{cosec}^2(\cot^{-1}3) =$

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1. Find the principal values of the following :

$$\sin^{-1}\left(-\frac{1}{2}\right)$$

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2. Find the principal value of each of the following: $\cos^{-1}\left(-\frac{\sqrt{3}}{2}\right)$

(ii) $\cos^{-1}\left(-\frac{1}{\sqrt{2}}\right)$

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3. Find the principal value of the following:

(i) $\cos ec^{-1}(2)$ (ii) $\tan^{-1}(-\sqrt{3})$ (iii) $\cos^{-1}\left(-\frac{1}{\sqrt{2}}\right)$

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4. Find the principal values of the following :

$$\tan^{-1}(-\sqrt{3})$$

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5. Find the principal values of the following :

$$\cos^{-1}\left(-\frac{1}{2}\right)$$

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6. Find the principal values of the following :

$$\tan^{-1}(-1)$$

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7. Find the principal values of the following :

$$\sec^{-1}\left(\frac{2}{\sqrt{3}}\right)$$

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8. Find the principal values of each of the following: $\cot^{-1}(-\sqrt{3})$

(ii) $\cot^{-1}(\sqrt{3})$

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9. Find the principal values of the following :

$$\cos^{-1}\left(-\frac{1}{\sqrt{2}}\right)$$

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10. What is the value of the following functions (using principal value)

$$\operatorname{cosec}^{-1}(\sqrt{2}) + \sec^{-1}(\sqrt{2})$$

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11. Find the principal values of the following :

$$\tan^{-1}(1) + \cos^{-1}\left(-\frac{1}{2}\right) + \sin^{-1}\left(-\frac{1}{2}\right)$$

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12. Find the principal values of the following :

$$\cos^{-1}\left(\frac{1}{2}\right) + 2 \sin^{-1}\left(\frac{1}{2}\right)$$

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13. Find the principal values of the following :

If $\sin^{-1} x = y$ then :

A. $0 < y < \pi$

B. $-\frac{\pi}{2} \leq y \leq \frac{\pi}{2}$

C. $0 < y < \pi$

D. $-\frac{\pi}{2} < y < \frac{\pi}{2}$

Answer: B



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14. Find the principal values of the following :

$\tan^{-1} \sqrt{3} - \sec^{-1}(-2)$ is equal to :

A. π

B. $-\frac{\pi}{3}$

C. $\frac{\pi}{3}$

D. $\frac{2\pi}{3}$

Answer: B

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Ncert File Question From Ncert Book Exercise 2 2

1. Prove that: $3 \sin^{-1} x = \sin^{-1}(3x - 4x^3)$, $x \in \left[-\frac{1}{2}, \frac{1}{2}\right]$

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2. Prove that: $3 \cos^{-1} x = \cos^{-1}(4x^3 - 3x)$, $x \in \left[\frac{1}{2}, 1\right]$

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3. Prove that: $\frac{\tan^{-1} 2}{11} + \frac{\tan^{-1} 7}{24} = \frac{\tan^{-1} 1}{2}$

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4. Prove the following

$$2 \tan^{-1} \frac{1}{2} + \tan^{-1} \frac{1}{7} = \tan^{-1} \frac{31}{17}$$

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5. If $x < 0$, then prove that $\cos^{-1} x = \pi + \tan^{-1} \frac{\sqrt{1-x^2}}{x}$

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6. Prove that $\tan^{-1} \frac{1}{\sqrt{x^2-1}} = \frac{\pi}{2} - \sec^{-1} x, x > 1$

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7. convert in the simplest form: $\tan^{-1}\left(\sqrt{\frac{1 - \cos x}{1 + \cos x}}\right), x < \pi$

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8. Find the value of

$$\tan^{-1}\left(\frac{\cos x - \sin x}{\cos x + \sin x}\right)$$

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9. $\tan^{-1} \frac{x}{\sqrt{a^2 - x^2}}, |x| < a$

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10. Write the following function in the simplest form:

$$\tan^{-1}\left(\frac{3a^2x - x^3}{a^3 - 3ax^2}\right), a > 0; \frac{-a}{\sqrt{3}} \leq x \leq \frac{a}{\sqrt{3}}$$

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11. Find the values of each of the following :

$$\tan^{-1} \left[2 \cos \left(2 \sin^{-1} \cdot \frac{1}{2} \right) \right]$$

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12. Evaluate $\cot(\tan^{-1} a + \cot^{-1} a)$

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$$13. \tan \left[\frac{1}{2} \left(\sin^{-1} \left(\frac{2x}{1+x^2} \right) + \cos^{-1} \left(\frac{1-y^2}{1+y^2} \right) \right) \right]$$

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14. If $\sin \left(\sin^{-1} \cdot \frac{1}{5} + \cos^{-1} x \right) = 1$, then find the value of x

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15. If $\tan^{-1}\left(\frac{x-1}{x-2}\right) + \tan^{-1}\left(\frac{x+1}{x+2}\right) = \frac{\pi}{4}$, then find the value of x .

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

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17. $\tan^{-2}\tan\left(\frac{3\pi}{4}\right)$

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18. Prove that : $\tan\left(\sin^{-1}\left(\frac{3}{5}\right) + \cot^{-1}\left(\frac{3}{2}\right)\right) = \frac{17}{6}$

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19. $\cos^{-1}\left(\cos\left(\frac{7\pi}{6}\right)\right)$ is equal to

A. $\frac{7\pi}{6}$

B. $\frac{5\pi}{6}$

C. $\frac{\pi}{3}$

D. $\frac{\pi}{6}$

Answer: B



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20. $\sin\left(\frac{\pi}{3} - \sin^{-1}\left(-\frac{1}{2}\right)\right)$ is equal to (A) $\frac{1}{2}$ (B) $\frac{1}{3}$ (C) $\frac{1}{4}$ (D) 1

A. $\frac{1}{2}$

B. $\frac{1}{3}$

C. $\frac{1}{4}$

D. 1

Answer: D



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21. $\tan^{-1} \sqrt{3} - \cot^{-1}(-\sqrt{3})$ is equal to (A) π (B) $-\frac{\pi}{2}$ (C) 0 (D) $2\sqrt{3}$

A. π

B. $-\frac{\pi}{2}$

C. 0

D. $2\sqrt{3}$

Answer: B



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Misellaneous Exercise On Chapter 2

1. Find the value the following :

$$\cos^{-1}\left(\cos. \frac{13\pi}{6}\right)$$

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2. Find the value the following :

$$\tan^{-1}\left(\tan. \frac{7\pi}{6}\right)$$

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3. Prove that : $2 \sin^{-1}\left(\frac{3}{5}\right) = \tan^{-1}\left(\frac{24}{7}\right)$

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$$4. \sin^{-1} \frac{8}{17} + \sin^{-1} \frac{3}{5} = \tan^{-1} \frac{77}{36}$$

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$$5. \text{ Prove that } \cos^{-1} \cdot \frac{4}{5} + \cos^{-1} \cdot \frac{12}{13} = \cos^{-1} \cdot \frac{33}{65}$$

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$$6. \cos^{-1} \left(\frac{12}{13} \right) + \sin^{-1} \left(\frac{3}{5} \right) = \sin^{-1} \frac{56}{65}$$

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$$7. \text{ Prove that: } \frac{\tan^{-1}(63)}{16} = \frac{\sin^{-1} 5}{13} + \frac{\cos^{-1} 3}{5}$$

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8. Prove that

$$\tan^{-1} \frac{1}{5} + \tan^{-1} \frac{1}{7} + \tan^{-1} \frac{1}{8} = \frac{\pi}{4}$$

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9. Prove that: $\tan^{-1} \sqrt{x} = \frac{1}{2} \cos^{-1} \left(\frac{1-x}{1+x} \right)$, $x \in [0, 1]$

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10. $\cot^{-1} \left(\frac{\sqrt{1+\sin x} + \sqrt{1-\sin x}}{\sqrt{1+\sin x} - \sqrt{1-\sin x}} \right) = \frac{x}{2}$

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11.

$$\tan^{-1} \left(\frac{\sqrt{1+x} - \sqrt{1-x}}{\sqrt{1+x} + \sqrt{1-x}} \right) = \frac{\pi}{4} - \frac{1}{2} \cos^{-1} x, \quad -\frac{1}{\sqrt{2}} \leq x \leq 1$$



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$$\begin{aligned} 12. \quad \frac{9\pi}{8} - \frac{9}{4}\sin^{-1} \frac{1}{3} &= \frac{9}{4}\sin^{-1} \frac{2\sqrt{2}}{3} \\ \frac{9\pi}{8} - \frac{9}{4}\sin^{-1} \frac{1}{3} & \\ &= \frac{9}{4} \left(\frac{\pi}{2} - \sin^{-1} \frac{1}{3} \right) = \frac{9}{4}\cos^{-1} \frac{1}{3} \\ &= \frac{9}{4}\sin^{-1} \sqrt{1 - \left(\frac{1}{3}\right)^2} \quad \left(\because \cos^{-1} x = \sin^{-1} \sqrt{1 - x^2} \right) \\ &= \frac{9}{4}\sin^{-1} \sqrt{\frac{8}{9}} = \frac{9}{4}\sin^{-1} \left(\frac{2\sqrt{2}}{3} \right) = \text{RHS Hence Proved.} \end{aligned}$$

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13. Solve : $2 \tan^{-1} (\cos x) = \tan^{-1} (2 \cos ecx)$

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14. If $\tan^{-1} \left(\frac{1-x}{1+x} \right) = \frac{1}{2} \tan^{-1} x, x > 0$, then $x = ?$

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15. $\sin(\tan^{-1} x)$, $|x| \leq 1$ is equal to :

A. $\frac{x}{\sqrt{1-x^2}}$

B. $\frac{1}{\sqrt{1-x^2}}$

C. $\frac{1}{\sqrt{1+x^2}}$

D. $\frac{x}{\sqrt{1+x^2}}$

Answer: D

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16. $\sin^{-1}(1-x) - 2\sin^{-1}x = \frac{\pi}{2}$, then x is equal to

A. $0, \frac{1}{2}$

B. $1, \frac{1}{2}$

C. 0

D. $\frac{1}{2}$

Answer: C

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17. $\tan^{-1}\left(\frac{x}{y}\right) - \frac{\tan^{-1}(x - y)}{x + y}$ is equal to (A) $\frac{\pi}{2}$ (B) $\frac{\pi}{3}$ (C) $\frac{\pi}{4}$ (D) $-\frac{3\pi}{4}$

A. $\frac{\pi}{2}$

B. $\frac{\pi}{3}$

C. $\frac{\pi}{4}$

D. $-\frac{3\pi}{4}$

Answer: C

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Exercise

1. The value of $\cos^{-1}\left(\cos\left(\frac{3\pi}{2}\right)\right)$ is

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2. Evaluate $\tan^{-1}\left\{\sin\left(-\frac{\pi}{2}\right)\right\}$

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

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4. Find the value of $\sec\left(\tan^{-1}\left(\frac{y}{2}\right)\right)$

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5. Find the value of $\sin \left[2 \cot^{-1} \left(-\frac{5}{12} \right) \right]$

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6. What is greater, $\tan 1$ or $\tan^{-1} 1$?

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7. Evaluate: $\cos \left(\frac{\sin^{-1} 1}{4} + \frac{\sec^{-1} 4}{3} \right)$

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8. Find the value of expression: $\sin \left(2 \frac{\tan^{-1} 1}{3} \right) + \cos (\tan^{-1} 2\sqrt{2})$

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9. Solve $\sin^{-1} x + \sin^{-1}(1 - x) = \cos^{-1} x$

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10. Find the solution of the equation

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

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Revision Exercise

1. $\sec(\operatorname{cosec}^{-1} x) =$

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2. Show that :

$$\cos(2 \tan^{-1} x) = \frac{1 - x^2}{1 + x^2}$$

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3. Prove that : (i) $\sin(\tan^{-1} 1) = \frac{1}{\sqrt{2}}$

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4. Prove that : $[\tan^{-1}(-\sqrt{3})] = -\frac{2}{\sqrt{3}}$

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5. Solve : $3 \tan^{-1}\left(\frac{1}{2 + \sqrt{3}}\right) - \tan^{-1}\left(\frac{1}{x}\right) = \tan^{-1}\left(\frac{1}{3}\right)$

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6. Solve $\sin^{-1}\left(\frac{5}{x}\right) + \sin^{-1}\left(\frac{12}{x}\right) = \frac{\pi}{2}$

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7. Show that : (i) $\sin^{-1}\left[\sin. \frac{3\pi}{4}\right] \neq \frac{3\pi}{4}$

(ii) $\tan^{-1}\left[\tan. \frac{5\pi}{6}\right] \neq \frac{5\pi}{6}$. What is its value ?

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8. Prove that : (i) $\tan^{-1} x + \cot^{-1}(x + 1) = \tan^{-1}(x^2 + x + 1)$

(ii) $\cot^{-1} 3 + \operatorname{cosec}^{-1} \sqrt{5} = \frac{\pi}{4}$

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9. Prove that

$$\sec^2(\tan^{-1} 2) + \operatorname{cosec}^2(\cot^{-1} 3) = 15$$

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10. prove that $2 \tan^{-1} \left(\sqrt{\frac{a-b}{a+b}} \tan \left(\frac{\theta}{2} \right) \right) = \cos^{-1} \left(\frac{a \cos \theta + b}{a + b \cos \theta} \right)$

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Check Your Understanding

1. Write the domain of $f(x) = \tan^{-1} x$

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2. The principal value of $\sin^{-1} \left(\frac{1}{2} \right)$ is

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3. Write the principal value of $\tan^{-1}(\sqrt{3}) + \operatorname{cosec}^{-1}(-2)$

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4. If $\sec^{-1}(x) + \operatorname{cosec}^{-1}\left(\frac{1}{3}\right) = \frac{\pi}{2}$, then find x .

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5. Is $\cos^{-1}(-x) = \pi - \cos^{-1}x$, $x \in [-1, 1]$?

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6. $\sin(\sec^{-1}x + \operatorname{cosec}^{-1}x)$

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7. Write down the value of $\tan^{-1} x + \cot^{-1} x, x \in R$

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8. Write down the value of $2 \sin^{-1} \frac{3}{5}$

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9. Find the solution of $\tan^{-1} 2x + \tan^{-1} 3x = \frac{\pi}{4}, x > 0$

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10. Is $\tan^{-1} \left(\sqrt{\frac{1-x^2}{1+x^2}} \right) = \frac{1}{2} \cos^{-1} x$ true?

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1. If $\cos^{-1} x - \cos^{-1} \cdot \frac{y}{2} = \alpha$, then $4x^2 - 4xy \cos \alpha + y^2$ is equal to

A. 4

B. $2 \sin^2 \alpha$

C. $-4 \sin^2 \alpha$

D. $4 \sin^2 \alpha$

Answer: d



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2. If $\sin^{-1} \left(\frac{x}{5} \right) + \cos ec^{-1} \left(\frac{5}{4} \right) = \frac{\pi}{2}$, then the value of x is

A. 3

B. 4

C. 5

D. 1

Answer: a



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3. The value of $\cot \left(\cos^{-1} \frac{5}{3} + \tan^{-1} \frac{2}{3} \right)$ is

A. $\frac{5}{17}$

B. $\frac{6}{17}$

C. $\frac{3}{17}$

D. $\frac{4}{17}$

Answer: b



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4.

If

$0 < x < 1$, then $\sqrt{1+x^2} \left[\{x \cos(\cot^{-1} x) + \sin(\cot^{-1} x)\}^2 - 1 \right]^{1/2}$

is equal to

A. $\frac{x}{\sqrt{1+x^2}}$

B. x

C. $x\sqrt{1+x^2}$

D. $\sqrt{1+x^2}$

Answer: c

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5. The value of $\cot \left(\sum_{n=1}^{23} \cot^{-1} \left(1 + \sum_{k=1}^n 2k \right) \right)$ is

A. $\frac{23}{25}$

B. $\frac{25}{23}$

C. $\frac{23}{24}$

D. $\frac{24}{23}$

Answer: B



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6. If $\tan^{-1} y = \tan^{-1} x + \tan^{-1} \left(\frac{2x}{1-x^2} \right)$, where $|x| < \frac{1}{\sqrt{3}}$.

Then, the value of y is

A. $\frac{3x - x^3}{1 - 3x^2}$

B. $\frac{3x + x^3}{1 - 3x^2}$

C. $\frac{3x - x^3}{1 + 3x^2}$

D. $\frac{3x + x^3}{1 + 3x^2}$

Answer: a

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7. Considering only the principal values of inverse functions, the set

$$A = \left\{ x \geq 0 : \tan^{-1}(2x) + \tan^{-1}(3x) = \frac{\pi}{4} \right\}$$

- A. is a singleton
- B. contains two elements
- C. contains more than two elements
- D. is an empty set .

Answer: a

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Chapter Test 2

1. If $\sin^{-1} x = y$, then

A. $0 \leq y \leq \pi$

B. $-\frac{\pi}{2} \leq y \leq \frac{\pi}{2}$

C. $0 < y < \pi$

D. $-\frac{\pi}{2} < y < \frac{\pi}{2}$

Answer: b

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2. The principal value of $\tan^{-1}(-\sqrt{3})$ is

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3. Find the value of $\sin^{-1}\left(\sin \frac{4\pi}{5}\right)$

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4. Prove that : $2 \sin^{-1} \frac{3}{5} = \tan^{-1} \frac{24}{7}$

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5. Simplify and write the value of $\tan^{-1} \left[2 \sin \left[2 \cos^{-1} \left[\frac{\sqrt{3}}{2} \right] \right] \right]$

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6. Prove that

$$\tan^{-1} \frac{1}{2} + \tan^{-1} \frac{1}{5} + \tan^{-1} \frac{1}{8} = \frac{\pi}{4}$$

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7. If $\tan^{-1} \left(\frac{x-2}{x-4} \right) + \tan^{-1} \left(\frac{x+2}{x+4} \right) = \frac{\pi}{4}$, find the value of x .

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8. Prove that $\frac{\tan^{-1}(\cos x)}{1 + \sin x} = \left(\frac{\pi}{4} - \frac{x}{2}\right)$

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9. Show that : $2 \sin^{-1} \left(\frac{3}{5}\right) - \tan^{-1} \left(\frac{17}{31}\right) = \frac{\pi}{4}$

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10. Prove that

$$\tan^{-1} x + \frac{\tan^{-1}(2x)}{1 - x^2} = \tan^{-1} \left(\frac{3x - x^3}{1 - 3x^2} \right), |x| < \frac{1}{\sqrt{3}}$$

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11. Prove that: $\tan^{-1} \left(\frac{\sqrt{1+x} - \sqrt{1-x}}{\sqrt{1+x} + \sqrt{1-x}} \right) = \frac{\pi}{4} -$

$\frac{1}{2} \cos^{-1} x, x \in (0, 1)$

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