



MATHS

BOOKS - JEEVITH PUBLICATIONS MATHS (KANNADA ENGLISH)

INVERSE TRIGONOMETRIC FUNCTIONS

Solved Example

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



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

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

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

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5. Find the principal value of the following: $\cos ec^{-1}2$



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6. Find the principal value of the following: $\tan^{-1}(-\sqrt{3})$

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

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

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

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10. Find the principal value of the following:

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

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

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12. Write the set of values of x for which $2 \tan^{-1} x = \tan^{-1} \frac{2x}{1-x^2}$ holds.

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13. Write the range of the principal value branch of the function $y = \operatorname{cosec}^{-1} x$

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14. Write the set of values of x for which $2 \tan^{-1} x = \sin^{-1} \frac{2x}{1+x^2}$ holds.

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15. Write the set of the value of x for which

$$2 \tan^{-1} x = \cos^{-1} \frac{1 - x^2}{1 + x^2} \text{ holds.}$$

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16. Find the principal value for $\cos^{-1} \left(\frac{1}{2} \right)$

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

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18. Evaluate $\sin^{-1} \left[\cos \left(\frac{\sin^{-1} 1}{2} \right) \right]$



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19. Find the domain of $\sin^{-1}(2x)$



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20. Write the range of the principal value branch of the function $y = \sin^{-1} x$



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21. Prove the following:

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



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22. Prove the following:

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

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23. Prove the following:

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

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24. Prove the following:

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

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25. Prove the following:

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

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26. Prove the following:

$$2 \tan^{-1} x = \cos^{-1} \left(\frac{1-x^2}{1+x^2} \right), \quad x \geq 0$$

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27. Prove the following:

$$2 \tan^{-1} x = \tan^{-1} \left(\frac{2x}{1-x^2} \right), \quad -1 < x < 1$$

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28. Prove the following:

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

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29. Prove the following:

$$\tan^{-1} \frac{2}{11} + \tan^{-1} \frac{7}{24} = \tan^{-1} \frac{1}{2}$$

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30. Prove the following:

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

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31. Simplify the following:

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

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32. Simplify the following:

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

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33. Simplify the following:

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

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34. Simplify the following:

$$\sin^{-1}\left(\sin\frac{3\pi}{5}\right)$$



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35. Simplify the following:

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



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36. Simplify the following:

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



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37. Simplify the following:

$$\tan\left(\sin^{-1}\frac{3}{5} + \cot^{-1}\frac{3}{2}\right)$$

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38. Simplify the following:

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

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39. Simplify the following:

$$\text{If } \sin\left\{\sin^{-1}\frac{1}{5} + \cos^{-1}x\right\} = 1 \text{ find } x$$

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40. Simplify the following:

Evaluate $\sin^{-1}[\sin(-600^\circ)]$

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41. Simplify the following:

Evaluate $\tan\left(\cos^{-1}\frac{3}{5} + \tan^{-1}\frac{1}{4}\right)$

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42. Simplify the following:

Evaluate $\cos^{-1}[\cos(-680)]$

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43. Simplify the following:

$$\text{Evaluate } \tan^{-1}\left(\frac{x}{y}\right) - \tan^{-1}\left(\frac{x-y}{x+y}\right)$$

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44. Write the following in the simplest form of

$$\tan^{-1}\left(\frac{\cos x - \sin x}{\cos x + \sin x}\right), 0 < x < \frac{\pi}{2}$$

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45. Express $\tan^{-1}\left(\frac{\cos x}{1 - \sin x}\right)$, $-\frac{3\pi}{2} < x < \frac{\pi}{2}$ in the simplest form.

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46. $\tan^{-1} \left(\sqrt{\frac{1 - \cos x}{1 + \cos x}} \right), 0 < x < \pi$

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47. Write $\cot^{-1} \left(\frac{1}{\sqrt{x^2 - 1}} \right), x > 1$, in the simplest form.

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48. Write the following in the simplest form:

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

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49. Write the following in the simplest form:

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

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50. Write the following in the simplest form:

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

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51. Write the following in the simplest form:

$$\tan^{-1}\left(\frac{3a^2x - x^3}{a^3 - 3ax^2}\right)$$

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

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53. Prove that $\tan^{-1}x + \tan^{-1}y = \tan^{-1}\left(\frac{x+y}{1-xy}\right)$

when $xy < 1$

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54. Prove that

$$\tan^{-1}x - \tan^{-1}y = \tan^{-1}\left(\frac{x-y}{1+xy}\right), xy > -1$$

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55. Prove that $2\tan^{-1}\frac{1}{2} + \tan^{-1}\frac{1}{7} = \tan^{-1}\frac{31}{17}$

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56. If $\tan^{-1}\frac{x-1}{x-2} + \tan^{-1}\frac{x+1}{x+2} = \frac{\pi}{4}$, find x

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

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58. Prove that

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

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

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60. Show that $\sin^{-1} \frac{12}{13} + \cos^{-1} \frac{4}{5} + \tan^{-1} \frac{63}{16} = \pi$

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61. Prove that

$$\tan^{-1} \left(\frac{1}{5} \right) + \tan^{-1} \left(\frac{1}{7} \right) + \tan^{-1} \left(\frac{1}{3} \right) + \tan^{-1} \left(\frac{1}{8} \right) = \frac{\pi}{4}$$

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62. Prove that $\cot^{-1} \left[\frac{\sqrt{1 + \sin x} + \sqrt{1 - \sin x}}{\sqrt{1 + \sin x} - \sqrt{1 - \sin x}} \right]$

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

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

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

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66. $\frac{9\pi}{8} - \frac{9}{4}\sin^{-1}\frac{1}{3} = \frac{9}{4}\sin^{-1}\left(\frac{2\sqrt{2}}{3}\right)$

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67. Solve for x

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

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

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Find The Values Of Each Of The Following

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



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



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3. $\tan^{-1}\left(\tan\frac{\pi}{3}\right)$



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4. Simplify the following:

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



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5. $\tan^{-1}\left(\tan\frac{2\pi}{3}\right)$



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6. Simplify the following:

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



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

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

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Write The Following In The Simplest Form

1. $\tan^{-1} \frac{1}{\sqrt{x^2 - 1}} |x| > 1$

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$$2. \tan^{-1} \left[\frac{3a^2x - x^3}{a^3 - 3ax^2} \right]$$



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



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$$4. \tan \frac{1}{2} \left[\sin^{-1} \frac{2x}{1+x^2} + \cos^{-1} \frac{1-y^2}{1+y^2} \right]$$



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Try Your Self

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

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

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

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