MATHS

BOOKS - V PUBLICATION

INVERSE TRIGONOMETRIC FUNCTIONS

Question Bank

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

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2. Find the principal value of

$\cot^{-1}\left(\dfrac{-1}{\sqrt{3}}\right)$

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

4. find the principle value of $\cos^{-1}\left(\dfrac{\sqrt{3}}{2}\right)$

5. Find the principle value of the following

$\cos ec^{-1}(2)$

6. Find the principle value of the following

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

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

8. Find the principle value of the following

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

9. Find the principle value of the following

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

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

11. Find the principal values of the following $\cos^{-1}\left(-\dfrac{1}{\sqrt{2}}\right)$

12. Find the principal values of the following $\cos ec^{-1}\left(-\sqrt{2}\right)$

13. Find the values of the following $\tan^{-1}(1) + \cos^{-1}\left(-\dfrac{1}{2}\right) + \sin^{-1}\left(-\dfrac{1}{2}\right)$

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

15. If $\sin^{-1} x = y$, then find the range of y

    A. '0 le y le pi'

    B. '-pi/2 le y le pi/2'

    C. '0ltyltpi'

    D. '-pi/2ltyltpi/2'

Answer: B

16. Find tan^(-1) sqrt3 -sec^(-1)(-2)

    A. 'pi'

    B. '-pi/3'

C. 'pi/3'

D. '(2 pi)/3'

Answer: B

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17. Prove that
$$\tan^{-1}\left(\frac{1}{2}\right) + \tan^{-1}\left(\frac{2}{11}\right) = \tan^{-1}\left(\frac{3}{4}\right)$$

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18. Express $\tan^{-1}\left(\frac{\cos x}{1 - \sin x}\right)$ in the simplest Form.

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19. Express $\cot^{-1}\left(\dfrac{1}{\sqrt{x^2-1}}\right)$, $|x| > 1$ in the simplest form.

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

21. Find the value of $\cos\left(\sec^{-1} x + \cos ec^{-1} x\right)$, $|x| \geq 1$

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

23. prove that

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

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24. Prove that $\tan^{-1}\left(\dfrac{2}{11}\right) + \tan^{-1}\left(\dfrac{7}{24}\right) = \tan^{-1}\left(\dfrac{1}{2}\right)$

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

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26. Write the following functions in the simplest form :

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

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27. Write the following functions in the simplest form :

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

28. Write the following functions in the simplest form :

$$\tan^{-1}\sqrt{\frac{1 - \cos x}{1 + \cos x}}, \ 0 < x < \pi$$

29. Write the following functions in the simplest form :

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

30. Write the following functions in the simplest form :

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

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31. Write the following functions 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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32. Find the values of each of the following $\tan^{-1}\left[2\cos\left(2\sin^{-1}\left(\frac{1}{2}\right)\right)\right]$

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33. Find the value of

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

34. Find the values of the following

$$\tan \frac{1}{2} \left[\sin^{-1} \left(\frac{2x}{1+x^2} \right) + \cos^{-1} \left(\frac{1-y^2}{1+y^2} \right) \right], \ |x| < 1, \ y > 0 \ \text{and} \ xy < 1$$

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

36. 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.

37. Find the value of

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

38. Find the values of the following :

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

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

40. $\cos^{-1}\left(\cos\left(\frac{7\pi}{6}\right)\right)$ is equal to A) $\frac{7\pi}{6}$ B) $\frac{5\pi}{6}$ C) $\frac{\pi}{3}$ D) $\frac{\pi}{6}$

A. (7 pi)/6'

B. (5 pi)/6 '

C. pi/3 '

D. pi/6'.

Answer: B

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41. Find sin(pi/3-sin^(-1)((-1/2))`=

A. 1/2'

B. 1/3'

C. 1/4'

D. 1

Answer: D

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

A. pi'

B. (-pi)/2'

C. 0

D. 2 sqrt3'

Answer: B

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

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44. show that $\sin^{-1}\dfrac{3}{5} - \sin^{-1}\dfrac{8}{17} = \cos^{-1}\dfrac{84}{85}$

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45. Prove that $\sin^{-1}\dfrac{12}{13} + \cos^{-1}\dfrac{4}{5} + \tan^{-1}\dfrac{63}{16} = \pi$

46. Simplify $\tan^{-1}\left[\dfrac{a\cos x - b\sin x}{b\cos x + a\sin x}\right]$ if, $\dfrac{a}{b}\tan x > (-1)$

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

48. Find the value of the following

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

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

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

51. prove $\sin^{-1}\left(\dfrac{8}{17}\right) + \sin^{-1}\left(\dfrac{3}{5}\right) = \tan^{-1}\left(\dfrac{77}{36}\right)$

52. prove $\cos^{-1}\left(\dfrac{4}{5}\right) + \cos^{-1}\left(\dfrac{12}{13}\right) = \cos^{-1}\left(\dfrac{33}{65}\right)$

53. Prove the following :

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

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54. prove the following

$$\tan^{-1}\frac{63}{16} = \sin^{-1}\frac{5}{13} + \cos^{-1}\frac{3}{5}$$

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55. Show that

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

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56. prove that

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

57. Prove the following :

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

58. prove

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

59. Prove the following :

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

60. Solve the following

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

61. Solve the following :

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

62. $\sin(\tan^{-1}x), |x| < 1$ is equal to

    A. x/(sqrt(1-x^2)'

    B. 1/(sqrt(1-x^2)'.

    C. 1/(sqrt(1+x^2)'

    D. x/(sqrt(1+x^2)'

63. $\sin^{-1}(1-x) - 2\sin^{-1}x = \dfrac{\pi}{2}$, then find x

A. 0,1/2

B. 1,1/2

C. 0

D. 1/2'

64. $\tan^{-1}\left(\dfrac{x}{y}\right) - \tan^{-1}\left(\dfrac{x-y}{x+y}\right) =$

A. pi/2'

B. pi/3'

C. pi/4'

D. (-3pi)/4'

Answer: C

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65. Find the principal values $\cos^{-1}\left(\dfrac{-\sqrt{3}}{2}\right)$

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66. Find the principal values $\cos ec^{-1}((-2))$

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67. Evaluate the following $\sin\left[\dfrac{\pi}{2} - \sin^{-1}\left(\dfrac{-\sqrt{3}}{2}\right)\right]$

68. If $\tan^{-1}\left(\dfrac{3}{4}\right) = \theta$, find the value of $\sin\theta$

69. Prove that $\tan^{-1}\left(\dfrac{1}{7}\right) + \tan^{-1}\left(\dfrac{1}{13}\right) = \tan^{-1}\left(\dfrac{2}{9}\right)$

70. Prove that $\sin^{-1}\left(\dfrac{4}{5}\right) + \sin^{-1}\left(\dfrac{5}{13}\right) + \sin^{-1}\left(\dfrac{16}{65}\right) = \dfrac{\pi}{2}$

71. Prove that

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

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

73. If $\cos^{-1}x + \cos^{-1}y + \cos^{-1}z = \pi$ and $0 < x, y, z < 1$,show that $x^2 + y^2 + z^2 + 2xyz = 1$

74. If $(-1) < x, y, z \le 1$such that $\sin^{-1}x + \sin^{-1}y + \sin^{-1}z = \frac{3\pi}{2}$, find the value of

$$x^{2000} + y^{2001} + z^{2002} - \left(\frac{9}{x^{2000} + y^{2001} + z^{2002}} \right)$$

75. If $\tan^{-1} x + \tan^{-1} y + \tan^{-1} z = \pi$, show that

$$x + y + z = xyz$$

76. Show that 'tan ^(-1) (m/n)-tan ^(-1) ((m-n)/(m+n))=pi/4'

77. Show that $\tan^{-1} n + \cot^{-1}(n + 1) = \tan^{-1}(n^2 + n + 1)$

78. Prove that $2\tan^{-1}\left[\left(\sqrt{\dfrac{a-b}{a+b}}\right)\tan\left(\dfrac{\theta}{2}\right)\right] = \cos^{-1}\left(\dfrac{b+a\cos\theta}{a+b\cos\theta}\right)$

79. i) In which range is the inverse of sine defined? ii) What is the range for the inverse of cosine function? iii) Evaluate $\cos\left[\sin^{-1}\left(\dfrac{-4}{5}\right)\right]$

80. Prove that $\tan^{-1}\left(\dfrac{\sqrt{1+x^2}+\sqrt{1-x^2}}{\sqrt{1+x^2}-\sqrt{1-x^2}}\right) = \dfrac{\pi}{4} + \dfrac{1}{2}\cos^{-1}x^2$