



## MATHS

### BOOKS - PRADEEP PUBLICATION

### INVERSE TRIGONOMETRIC FUNCTIONS

#### Example

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

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2. Prove that  $\cos^{-1}\left(\cos\left(\frac{5\pi}{3}\right)\right) = \frac{\pi}{3}$

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3. Prove that  $\cos^{-1}\left(\frac{\sin x + \cos x}{\sqrt{2}}\right) = x - \left(\frac{\pi}{4}\right), \left(\frac{\pi}{4}\right) \leq x \leq \left(\frac{5\pi}{4}\right)$

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4. Evaluate :

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

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5. Evaluate :

$$\sin\left(2 \sin^{-1}\left(-\left(\frac{4}{5}\right)\right)\right)$$

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6. Evaluate :

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

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7. Evaluate :

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



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8. Evaluate :

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



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9. Evaluate :

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



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10. Prove that :

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

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11. Prove that :  $\cos^{-1}(\cos^2 x - \sin^2 x) = 2x$

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12.  $2 \cos^{-1} x = \sin^{-1} \left( 2x \sqrt{1-x^2} \right)$  is valid for all value of  $x$  satisfying:

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13. Prove that:  $\cos(\cos^{-1} x) = \cos ec(\cos ec^{-1} x)$ .

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14. Prove that :

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

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15. Prove that :

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

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16. Find the value of  $\sin^{-1}(\cos(\sin^{-1} x)) + \cos^{-1}(\sin(\cos^{-1} x))$

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17. Simplify :  $\sin^{-1} \left( x \sqrt{1-x} + \sqrt{x} \sqrt{1-x^2} \right), 0 \leq x \leq 1.$

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18. Simplify  $\cos^{-1}\left(\frac{3}{5}\cos x + \frac{4}{5}\sin x\right)$ ,  $x \in \left(-\frac{2\pi}{3}, \frac{\pi}{4}\right)$

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

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20. Prove that :

$$\sin^{-1} x + \sin^{-1} 2x = \frac{\pi}{3}$$

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21. Prove that :  $\sin^{-1}\left(\frac{4}{5}\right) + \sin^{-1}\left(\frac{5}{13}\right) = \cos^{-1}\left(\frac{16}{25}\right)$

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22. Solve the following equations:

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

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23. Solve the equation :

$$\cos^{-1}\left(\frac{a}{x}\right) - \cos^{-1}\left(\frac{b}{x}\right) = \cos^{-1}\left(\frac{1}{b}\right) - \cos^{-1}\left(\frac{1}{a}\right), |a| \geq 1, |b| \geq 1.$$

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24. Prove that :

$$\sin^{-1}\left(\frac{3}{5}\right) + \sin^{-1}\left(\frac{8}{17}\right) = \cos^{-1}\left(\frac{36}{85}\right)$$

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25. Prove that :

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



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26. Prove that :

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

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27. Prove that :  $\cos^{-1}\left(\frac{4}{5}\right) + \cos^{-1}\left(\frac{12}{13}\right) = \cos^{-1}\left(\frac{33}{65}\right)$

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28. Show that  $\sin^{-1}\left(\frac{4}{5}\right) + \sin^{-1}\left(\frac{5}{13}\right) + \sin^{-1}\left(\frac{16}{65}\right) = \frac{\pi}{2}$

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29.

If

$\cos^{-1} x + \cos^{-1} y + \cos^{-1} z = \pi$  , prove that  $x^2 + y^2 + z^2 + 2xyz = 1$





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30. The greatest and least values of  $(\sin^{-1} x)^2 + (\cos^{-1} x)^2$  are respectively:



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31. Evaluate  $\tan^{-1}(-1)$



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



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

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

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

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36. Prove that  $\tan 1 > 1 > \tan^{-1} 1$ .

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37. Prove that  $\tan(\cot^{-1} x) = \cot(\tan^{-1} x)$ . State with reason whether the equality is valid for all values of  $x$ .

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38. Find the values of  $\tan^{-1}(\tan 5)$

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39. Evaluate  $\sin\left(2 \cot^{-1}\left(-\frac{5}{12}\right)\right)$

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

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41. 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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42. 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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43. Prove that  $\cot^{-1}(13) + \cot^{-1}(21) + \cot^{-1}(-8) = \pi$

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

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45. Prove that  $\cot\left(\frac{\pi}{4} - 2 \cot^{-1} 3\right) = 7$

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46. Prove that  $\sin\left(2 \frac{\tan^{-1} 1}{3}\right) + \cos(\tan^{-1} 2 \sqrt{2}) = \frac{14}{15}$

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47. Prove that  $\cos\left(2 \frac{\tan^{-1} 1}{7}\right) = \sin\left(4 \frac{\tan^{-1} 1}{3}\right)$

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48. Prove that  $\tan^{-1}\left(\frac{x}{\sqrt{a^2 - x^2}}\right) = \sin^{-1}\left(\frac{x}{a}\right)$ ,  $|x| < a$ .

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49. Prove that  $\tan^{-1}\left(\frac{(\sqrt{1+X^2} + 1)}{x}\right) = \frac{\pi}{2} - \frac{1}{2}\tan^{-1}x.$

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50. Prove that :

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

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

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52. Write the following function in the simplest form:  $\tan^{-1}\left(\frac{\cos x - \sin x}{\cos x + \sin x}\right), -\pi/4$



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53. Write the following functions in the simplest form :

$$\frac{\tan^{-1}(\cos x)}{1 - \sin x}, \quad -\frac{3\pi}{2} < x < \frac{\pi}{2}$$

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54. 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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55. Prove that  $2 \tan^{-1} \sqrt{\frac{1-x}{1+x}} = x, -1 \leq x \leq 1$

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56. Prove that :  $\tan^{-1} \left[ \frac{\sqrt{1+x} - \sqrt{1-x}}{\sqrt{1+x} + \sqrt{1-x}} \right] = \frac{\pi}{4} - \frac{1}{2} \cos^{-1} x$

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57. Prove that :  $\cot^{-1} \left[ \frac{\sqrt{1 + \sin x} + \sqrt{1 - \sin x}}{\sqrt{1 + \sin x} + \sqrt{1 - \sin x}} \right] = \frac{x}{2}, x \in \left(0, \frac{\pi}{4}\right)$

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58. Show that  $4 \tan^{-1} \left( \frac{1}{5} \right) - \tan^{-1} \left( \frac{1}{70} \right) + \tan^{-1} \left( \frac{1}{99} \right) = \frac{\pi}{4}$

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

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

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

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62.  $\cot^{-1} \frac{ab + 1}{a - b} + \cot^{-1} \frac{bc + 1}{b - c} + \cot^{-1} \frac{ca + 1}{c - a} = 0$

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

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64. show that

$$\tan^{-1} \left\{ \tan \frac{\alpha}{2} \tan \left( \frac{\pi}{4} - \frac{\beta}{2} \right) \right\} = \sin^{-1} \left( \frac{\sin \alpha \cos \beta}{\cos \alpha + \sin \beta} \right) \text{ where } \alpha, \beta \in (0, \frac{\pi}{2})$$

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65. Show that  $\sin^{-1}\left(\frac{12}{13}\right) + \cos^{-1}\left(\frac{4}{5}\right) + \tan^{-1}\left(\frac{63}{16}\right) = \pi$

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66. Solve the following equation

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

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67. 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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68. Solve the following equations:

$$\cos(\tan^{-1} x) = \sin(\cot^{-1}(x+1))$$

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69. Solve for  $x$ :  $(\tan^{-1} x)^2 + (\cot^{-1} x)^2 = \frac{5\pi^2}{8}$

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70. Solve  $\sin[2 \cos^{-1}\{\cot(2 \tan^{-1} x)\}] = 0$

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

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72. Prove that  $\sec[\cot^{-1}\{\sin(\tan^{-1}(\cos ec(\cos^{-1} a)))\}] = \sqrt{3-a^2}$ ,

where  $|a| < 1$

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73. Evaluate  $\cos e c^{-1}(2/\sqrt{3})$

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74. The principal value of  $\sec^{-1}(-2)$  is  $\frac{2\pi}{3}$ .

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75. Find the value of  $\tan(\sec^{-1}(-1))$

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76. Integrate the function:  $\frac{1}{x - \sqrt{x}}$

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77. Find the value of the following

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

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78. Show that  $\sec^{-1}\left(\frac{1}{2x^2 - 1}\right) = 2 \cos^{-1} x, 0 \leq x \leq 1, x \neq \frac{1}{2}$

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79. Write  $\tan^{-1}\left(\frac{1}{\sqrt{x^2 - 1}}\right), |x| > 1$  in simplest form.

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80. Show that :

$$\sec(\tan^{-1} x) = \sqrt{x^2 + 1} \text{ or } \text{all } x \in R$$

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81. Show that :

$$\operatorname{cosec}(\cot^{-1} x) = \sqrt{x^2 + 1} \text{ for all } x \in \mathbb{R}$$

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82. Show that :

$$\sec^{-1} x = \tan^{-1} \sqrt{x^2 - 1} \text{ for } x \geq 1$$

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83. Show that :

$$\tan^{-1} x = \sec^{-1} \sqrt{1 + x^2} \text{ for } x \geq 0$$

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84. Find the value  $2 \tan^{-1} \left( \frac{1}{5} \right) + \sec^{-1} \left( \frac{5\sqrt{2}}{7} \right) + 2 \tan^{-1} \left( \frac{1}{8} \right)$

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85. find values  $\tan^{-1}(1) + \sin^{-1}\left(-\frac{1}{2}\right)$

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86. Solve the equation

$$\sec^{-1}\left(\frac{x}{a}\right) - \sec^{-1}\left(\frac{x}{b}\right) = \sec^{-1} b - \sec^{-1} a \quad |a| \geq 1, |b| \geq 1$$

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## Exercise

1. Find the 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. Find the value of

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

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4. Find the value of

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

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

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6. Find the value of

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

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7. Find the value of

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

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

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9. Find the value of

$$\sin(\sin^{-1}x + \cos^{-1}x), |x| \leq 1$$



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10. Find the value of

$$\sin^{-1}\left(\sin\left(0\frac{\pi}{10}\right)\right)$$



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11. Find the value of

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



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12. Find the value of

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



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13. Prove that following :

$$2 \sin^{-1} x = \cos^{-1}(1 - 2x^2), 0 \leq x \leq 1$$

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

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

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16. Prove that following :

$$\cos^{-1} x = 2 \frac{\sin^{-1} \sqrt{1-x}}{2} = 2 \frac{\cos^{-1} \sqrt{1+x}}{2}, |x| \leq 1$$

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17. Prove that following :

$$\sin\left(2 \cos^{-1}\left(-\frac{4}{5}\right)\right) = -\left(\frac{24}{25}\right)$$



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18. Prove that following :

$$\cos\left(2 \sin^{-1}\left(-\frac{2}{5}\right)\right) = \frac{17}{25}$$



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19. Prove that following :

$$\cos\left(3 \cos^{-1}\left(\frac{2}{5}\right)\right) = -\frac{118}{125}$$



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20. Write the following functions in the simplest form:

$$\sin^{-1} \sqrt{1 - x^2}, 0 \leq x \leq 1$$



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21. Write the following functions in the simplest form:

$$\cos^{-1} \sqrt{1 - x^2}, 0 \leq x \leq 1$$



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22. Write the following functions in the simplest form:

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



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23. Write the following functions in the simplest form:

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



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24. Find  $x$  if  $\cos\left(\sin^{-1}\left(\frac{1}{5}\right) + \cos^{-1}x\right) = 0$



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25. Find  $x$  if  $\sin^{-1}\left(\frac{8}{x}\right) + \sin^{-1}\left(\frac{15}{x}\right) = \frac{\pi}{2}$



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26. Find  $x$  if  $\cos^{-1} x + \sin^{-1}\left(\frac{x}{2}\right) = \frac{\pi}{6}$



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27. Find  $x$  if  $\sin^{-1} x + \sin^{-1}(1 - x) = \cos^{-1} x$



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28. Find  $x$  if  $\sin^{-1}(6x) + \sin^{-1}(6\sqrt{3}x) = -\frac{\pi}{2}$



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**29.** Prove that :

$$\sin^{-1}\left(-\frac{4}{5}\right) = \cos^{-1}\left(-\frac{3}{5}\right) - \pi$$

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**30.** Prove that :

$$\sin^{-1}\left(\frac{3}{5}\right) + \sin^{-1}\left(\frac{8}{17}\right) = \sin^{-1}\left(\frac{77}{85}\right)$$

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**31.** Prove that :

$$\cos\left(\sin^{-1}\left(\frac{3}{5}\right) + \sin^{-1}\left(\frac{5}{13}\right)\right) = \frac{33}{65}$$

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**32.** Prove that :

$$\sin^{-1}\left(\frac{3}{5}\right) + \sin^{-1}\left(\frac{5}{13}\right) = \cos^{-1}\left(\frac{33}{65}\right)$$



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33. Prove that :

$$\cos^{-1}\left(\frac{8}{17}\right) - \cos^{-1}\left(\frac{3}{5}\right) = \cos^{-1}\left(\frac{84}{85}\right)$$



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



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35. Find the value of  $\tan^{-1}\left(-\frac{1}{\sqrt{3}}\right)$



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





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37. Find the value of  $\cot^{-1}(-\sqrt{3})$



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



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



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40. Find the value of  $\sec(\tan^{-1}(-\sqrt{3}))$



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41. The value of  $\cot(\tan^{-1} x + \cot^{-1} x)$  is equal to :

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

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43. Find the value of  $\tan\left(\frac{\cos^{-1} 4}{5} + \cot^{-1}\left(\frac{3}{2}\right)\right)$

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44. Find the value of  $\tan^{-1}\left\{9 \cos\left(2 \sin^{-1}\left(\frac{2}{3}\right)\right)\right\}$

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**45.** Prove that

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

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**46.** Prove the following:  $\tan^{-1}\left(\frac{2}{11}\right) + \tan^{-1}\left(\frac{7}{24}\right) = \tan^{-1}\left(\frac{1}{2}\right)$

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**47.** Prove that

$$\tan^{-1}\left(\frac{1}{7}\right) + \tan^{-1}\left(\frac{1}{13}\right) = \tan^{-1}\left(\frac{2}{9}\right)$$

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**48.** Prove that

$$2 \tan^{-1}\left(\frac{1}{2}\right) + \tan^{-1}\left(\frac{1}{9}\right) = \tan^{-1}\left(\frac{39}{23}\right)$$

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

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50. Prove that

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

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51. Prove that

$$\sin^{-1}\left(\frac{4}{5}\right) + \cos^{-1}\left(\frac{12}{13}\right) = \tan^{-1}\left(\frac{63}{16}\right)$$

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



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53. Prove that

$$\cot^{-1} 7 + \cot^{-1} 8 + \cot^{-1} 18 = \cot^{-1} 3$$

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54. Prove that

$$4 \tan^{-1} \left( \frac{1}{5} \right) - \tan^{-1} \left( \frac{1}{239} \right) = \frac{\pi}{4}$$

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55. Prove that

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

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**56.** Prove that

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



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**57.** Prove that

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



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**58.** Prove that

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



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59. Prove that

$$\tan^{-1} \left( \frac{\sqrt{x} + \sqrt{y}}{1 - (\sqrt{xy})} \right) = \tan^{-1} \sqrt{x} + \tan^{-1} \sqrt{y}, \quad x > 0, y > 0, xy < 1$$

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60. Prove that

$$\frac{\tan^{-1}(x + \sqrt{x})}{1 - x\sqrt{x}} = \tan^{-1} x + \tan^{-1} \sqrt{x}, \quad 0 \leq x < 1$$

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61. Prove that

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

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62. Prove that

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

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63. Prove that

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

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

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65. Prove that

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

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66. Prove that :

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

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67. Write in the simplest form :  $\tan^{-1}(\sin x/(1 + \cos x))$

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

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69. Write the following in the simplest form

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

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70. Express the following functions in the simplest form :

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

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71. Express the following functions in the simplest form :

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

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72. Express the following functions in the simplest form :

$$\tan^{-1}\left(\sqrt{\frac{1-x}{1+x}}\right), -1 < x \leq 1$$

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73. Express the following functions in the simplest form :

$$\cot^{-1}\left(\sqrt{1+x^2} - x\right)$$

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74. Express the following functions in the simplest form :

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

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75. Express the following functions in the simplest form :

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

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76. Express the following functions in the simplest form :

$$\frac{\tan^{-1}(a \cos x - b \sin x)}{b \cos x + a \sin x}, -\frac{\pi}{2} < x < \frac{\pi}{2} \text{ and } \frac{a}{b} \tan x > -1$$



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77. Solve :  $\cot^{-1}(2x) + \cot^{-1}(3x) = \frac{\pi}{4}$



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78. Solve the following equations.

$$\cot^{-1} x - \cot^{-1}(x + 2) = \frac{\pi}{12}, x > 0$$



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79. Solve the following equations:

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



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

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81. Solve the following equations.

$$\cos^{-1}\left(\frac{1-x^2}{1+x^2}\right) + \tan^{-1}\left(\frac{2x}{1-x^2}\right) = \frac{2\pi}{3}, 0 \leq x < 1$$

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82. 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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83. Solve the following equations.

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

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84. Solve the following equations.

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

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85. Solve the following equations.

$$\frac{\tan^{-1}(x - 1)}{x - 2} + \tan 6 - 1 \frac{x + 1}{x + 2} = \frac{\pi}{4}$$

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86. Solve :  $\left(\left(\tan^{-1}\left(\frac{2x - 3}{2x - 5}\right) + \tan^{-1}\left(\frac{2x + 3}{2x + 5}\right)\right)\right) = \frac{\pi}{4}$ .

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87. Solve the following equations.

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

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88. 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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89. Prove that for  $0 < a < b < c$

$$\frac{\cot^{-1}(1 + ab)}{a - b} + \frac{\cot^{-1}(1 + bc)}{b - c} + \frac{\cot^{-1}(1 + ca)}{c - a} = \pi$$

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

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91. Find the value of the following:

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



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92. Prove that :  $\tan^{-1} \left[ \frac{\sqrt{1+x^2} - \sqrt{1-x^2}}{\sqrt{1+x^2} + \sqrt{1-x^2}} \right] = \frac{\pi}{4} - \frac{1}{2} \cos^{-1} x^2$



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



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94. If  $x \in R$ , find the maximum and minimum values of  $2 \tan^{-1} x + \sin^{-1} \left( \frac{2x}{1+x^2} \right)$



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95. Find the values of  $\sec^{-1} \left( \frac{2}{\sqrt{3}} \right)$





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96. Find the values of  $\sec^{-1}\left(\sec\left(\frac{4\pi}{3}\right)\right)$



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97. Find the values of  $\cot(\operatorname{cosec}^{-1}(-1))$



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98. Show that  $2 \tan^{-1} x = \operatorname{cosec}^{-1}\left(\frac{1+x^2}{2x}\right)$ ,  $0 < |x| \leq 1$



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99. Solve the equation  $\operatorname{cosec}^{-1}\left(\frac{x}{8}\right) + \operatorname{cosec}^{-1}\left(\frac{x}{15}\right) = \frac{\pi}{2}$



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100. Solve the equation

$$\sec^{-1}\left(\frac{x}{a}\right) - \sec^{-1}\left(\frac{x}{b}\right) = \sec^{-1} b - \sec^{-1} a \mid a \geq 1, \mid b \geq 1$$

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101. Prove that  $\cot^{-1} x = \cos ec^{-1} \sqrt{1+x^2}$  or  $x \geq 0$

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102. Prove that  $\tan(\sec^{-1} x) = \sqrt{x^2 - 1}$  or  $x \geq 1$

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103. Prove that  $\cos ec^{-1} x = \cot^{-1} \sqrt{x^2 - 1}$  or  $x \geq 1$

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104. Prove that  $\cot(\cos^{-1}x) = \sqrt{x^2 - 1}$  or  $x \geq 1$

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105. Prove that :  $\sec^2(\tan^{-1}2) + \cos^2(\cot^{-1}3) = 15$

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106. Find the values of  $\tan^2(\sec^{-1}2) + \cot^2(\cos^{-1}3)$

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107. Write down the value of  $\sin^{-1}\left\{\sin\left(\frac{7\pi}{6}\right)\right\}$

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108. If  $\sin^{-1}x + \sin^{-1}y = -\pi$ , then find the values of  $x$  and  $y$



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109. If  $\sin^{-1} x + \sin^{-1} y = \frac{2\pi}{3}$ , then  $\cos^{-1} x + \cos^{-1} y$



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110. Find the value of  $\cos^{-1}\left(\cos\left(-\frac{\pi}{4}\right)\right)$



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111. What is the domain of the function  $f(x) = \sin^{-1} x + \sec^{-1} x$ ?



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112. What is the domain of the function  $f(x) = \cos^{-1} x + \sec^{-1} x$ ?



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113. Find the range of the function  $f(x) = \cos^{-1} x + \cos ec^{-1} x$ .

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114. Write down the domain of the function  $f(x) = \tan^{-1} x + \cot^{-1} x$ .

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115. Find the range of the function  $\sec^{-1} x + \cos ec^{-1} x, |x| \geq 1$ .

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116. If  $\cos ec^{-1} x = \sin^{-1} \left( \frac{1}{x} \right)$  for all  $x \in S$ , then find the set  $S$ .

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117. If  $\sec \left( \frac{1}{x} \right) = \cos^{-1} x$  for all  $x \in A$ , then find the set  $A$ .



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118. Find the value of  $\sin^{-1}(\cos(\sin^{-1} x)) + \cos^{-1}(\sin(\cos^{-1} x))$



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119. If  $\cot^{-1} x = \tan^{-1}\left(\frac{1}{x}\right)$  for all  $x \in S$ , then find the set  $S$ .



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120. Find the value of  $\tan(\sec^{-1}(-1))$



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121. Write down the value of  $\sec(\cos^{-1} x)$ , where  $|x| > 1$



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122. If  $|x| \geq 1$ , then  $\sin^{-1}\left(\frac{2x}{1+x^2}\right) = 2k$ . Write down the value of  $k$ .

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

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

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125. Evaluate  $\sin\left(2 \cos^{-1}\left(-\frac{3}{5}\right)\right)$

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126. Write down the conditions under which  $\tan^{-1} x + \tan^{-1} y = \tan^{-1} \frac{x+y}{1-xy}$ ,  $x, y$  in  $\mathbb{R}$ .

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127. If  $x \in \mathbb{R}$ , find the value of  $\cos(\tan^{-1} x + \cot^{-1} x)$

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128. What is the value of  $\cos^{-1}\left(\frac{1}{\sqrt{2}}\right)$ ?

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129. Evaluate  $\tan^{-1}\left(\frac{1}{2}\right) + \tan^{-1}\left(\frac{1}{3}\right)$

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130. Compute  $\tan^{-1}(2) - \tan^{-1}(1)$



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131. Find the value of  $\sin^{-1}\left(\frac{\sin(7\pi)}{4}\right)$



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132. Find the value of  $\cos^{-1}\left(\cos\left(\frac{7\pi}{6}\right)\right)$



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



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134. Write the value of  $\tan(2 \tan^{-1}(1/5))$



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135. If  $\tan^{-1} x + \tan^{-1} y = \pi/4$ ,  $xy < 1$ , then write the value of  $x + y + xy$ .

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136. Find the principal values of the following:

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

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137. Find the principal values of the following:

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

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**138.** Find the principal values of the following (2-8):

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

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**139.** Find the principal values of the following :

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

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**140.** Find the principal values of the following:

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

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**141.** Find the principal values of the following :

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



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**142.** Find the principal values of the following :

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

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**143.** Find the principal values of the following:

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

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**144.** Find the principal values of the following:

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

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**145.** Find the principal values of the following (2-8):

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

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**146.** Find the 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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**147.** Find the values of the following

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

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**148.** If  $\sin^{-1} x = y$ , then  $0 \leq y \leq \pi$

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:**

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

A.  $\pi$

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

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

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

**Answer:**

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

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

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152. Prove the following:  $\tan^{-1} \left(\frac{2}{11}\right) + \tan^{-1} \left(\frac{7}{24}\right) = \tan^{-1} \left(\frac{1}{2}\right)$

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

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154. Write the following function in the simplest form:

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

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155. Write the following function in the simplest form :

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

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156. Write the following functions in the simplest form:

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

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157. Write the following function in the simplest form:  $\tan^{-1}\left(\frac{\cos x - \sin x}{\cos x + \sin x}\right), -\pi/4$





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158. Write the following functions in the simplest form:

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



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159. Write the following function in the simplest form :  $\tan^{-1} \left( \frac{3a^2 x - x^3}{a^3 - 3ax^2} \right)$ ,  $a > 0$ ,  $-a/\sqrt{3}$



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



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161. Find the value of each of the following:

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

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162. Find the value of the following:

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

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

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164. 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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**165.** Find the values of each of the expressions

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

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**166.** Find the value of the following

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

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**167.** Find the values of each of the expressions

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

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

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169. Find the value of each of the following:

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

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

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

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

**Answer:**



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

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

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

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

D. 1

**Answer:**



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

A.  $\pi$

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

C. 0

D.  $2\sqrt{3}$

**Answer:**



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172. Find the value of

$$\cos^{-1}(\cos 10)$$

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

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

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175. Prove that :  $\sin^{-1}\left(\frac{8}{17}\right) + \sin^{-1}\left(\frac{3}{5}\right) = \sin^{-1}\left(\frac{77}{85}\right)$

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176. Prove that :  $\cos^{-1}\left(\frac{4}{5}\right) + \cos^{-1}\left(\frac{12}{13}\right) = \cos^{-1}\left(\frac{33}{65}\right)$

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177. Prove that :

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

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178. Prove that

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

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179. Prove that :

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

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180. 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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181. Prove that :  $\cot^{-1} \left[ \frac{\sqrt{1+\sin x} + \sqrt{1-\sin x}}{\sqrt{1+\sin x} + \sqrt{1-\sin x}} \right] = \frac{x}{2}$ ,  $x \in \left(0, \frac{\pi}{4}\right)$

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182. Prove that

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

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183. Prove that

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



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

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185. Solve the following equations:

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

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186.  $\sin(\tan^{-1}x), |x| < 1$  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:**



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

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

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

C. 0

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

**Answer:**



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**188.**  $\tan^{-1}\left(\frac{x}{y}\right) - \tan^{-1}\left(\frac{x - y}{x + y}\right)$  is equal to :

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

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

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

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

**Answer:**



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**189.** Fill in the blanks:

Domain of the function  $\sin^{-1} x$  is .....



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**190.** Range of function  $\cos^{-1} x$  is :



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**191.** The principal value of  $\tan^{-1} \sqrt{3}$  is .....



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



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193. Fill in the blanks:

Principal value of the function  $\tan^{-1} x$  lie in the interval.....



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194. Fill in the blanks:

$\tan^{-1} 1 + \sin^{-1}\left(-\frac{\sqrt{3}}{2}\right) + \cos^{-1}\left(-\frac{\sqrt{3}}{2}\right)$  is equal to .....



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195. Principal value of  $\cos^{-1}(-1/2)$  is :



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**196.** Fill in the blanks:

The value of  $\cos^{-1}\left(\cos 14\frac{\pi}{3}\right)$  is .....



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**197.** Fill in the blanks:

The set of values of  $\sec^{-1}\left(\frac{1}{2}\right)$  is .....



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**198.** Fill in the blanks:

For  $x \in \mathbb{R}$ ,  $\tan^{-1}(x^2 + 1) + \cot^{-1}(x^2 + 1)$  is equal to .....



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**199.** Fill in the blanks:

If  $\cos^{-1}(-x) = \alpha - \cos^{-1}x$ , then the value of  $\alpha$  is.....

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**200.** Fill in the blanks:

For  $|x| \geq \sqrt{2}$ ,  $\sec^{-1} \sqrt{x^2 - 1} + \cos^{-1} \sqrt{x^2 - 1}$  is equal to .....

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**201.** Fill in the blanks:

The value of  $\cot^{-1}(-x)$ , for all  $x$  in  $R$ , in terms of  $\cot^{-1}x$  is.....

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**202.** Fill in the blanks:

If  $\cos(\tan^{-1}x + \cot^{-1}\sqrt{3}) = 0$ , then value of  $x$  is .....





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203. The value of  $\cos(\sin^{-1} x + \cos^{-1} x)$  is equal to :



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204. Fill in the blanks:

The value of the expression  $\tan\left(\frac{\sin^{-1} x + \cos^{-1} x}{2}\right)$ , when  $x = \frac{\sqrt{3}}{2}$

is .....



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205. Fill in the blanks:

$\tan^{-1}\left(\tan\left(\frac{4\pi}{5}\right)\right)$  is equal to .....



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**206.** Fill in the blanks:

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

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**207.** Fill in the blanks:

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

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**208.** Fill in the blanks:

For  $x^2 > 1$ ,  $\sec(\cos ec^{-1} x) + \cos ec(\sec^{-1} x)$  is equal to.....

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

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**210.** True or False statements :

$$\cos^{-1} \left\{ \cos \left( \frac{9\pi}{8} \right) \right\} = \frac{7\pi}{8}$$

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**211.** True or False statements :

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

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**212.** True or False statements :

$$\sin^{-1} \sqrt{3} + \cos^{-1} \sqrt{3} = \frac{\pi}{2}$$

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**213.** True or False statements :

$$\sec^{-1}\left(\frac{1}{\sqrt{3}}\right) + \operatorname{cosec}^{-1}\left(\frac{1}{\sqrt{3}}\right) = \frac{\pi}{2}$$

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**214.** True or False statements :

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

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**215.** True or False statements :

$$\operatorname{cosec}^{-1}\left(\operatorname{cosec}\frac{9\pi}{10}\right) = \frac{\pi}{10}$$

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**216.** The value of the expressions  $(\cos^{-1} x)^2$  is equal to  $\sec^2 x$ .

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**217.** All trigonometric functions have inverse over their respective domains.

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**218.** Prove that

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

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**219.** True or False statements :

$$\cot(\cos^{-1} x) = \frac{x}{\sqrt{1-x^2}} \text{ for } |x| \leq 1$$

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**220.** True or False statements :

$$\sin^{-1} \sqrt{x} + \sec^{-1} \left( \frac{1}{\sqrt{x}} \right) = \frac{\pi}{2} \text{ for } 0 < x \leq 1.$$

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**221.** The minimum value of  $n$  for which  $\tan^{-1} \frac{n}{\pi} < \frac{\pi}{4}$ ,  $n \in N$ , is valid is 5.

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**222.** The domain of trigonometric functions can be restricted to any one of their branch (not necessarily principal value) in order to obtain their inverse functions.

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**223.** The least numerical value, either positive or negative of angle  $\theta$  is called principal value of the inverse trigonometric function.

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**224.** The graph of  $y = 6$  is a line

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**225.** The principal value of  $\sin^{-1} \left[ \cos \left( \sin^{-1} \frac{1}{2} \right) \right]$  is  $\frac{\pi}{3}$ .

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**226.** The graph of inverse trigonometric function can be obtained from the graph of their corresponding trigonometric function by interchanging  $x$  and  $y$  axes.

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227.  $\tan 1 > \tan^{-1} 1$



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228. Match the following

Column I	Column II
1. Domain of the function $\tan^{-1} x$	(p) $\frac{x}{\sqrt{1+x^2}}$
2. If $\sin^{-1} x + \sin^{-1} y = \pi$ then $\cos^{-1} x + \cos^{-1} y$ is equal to	(q) $\frac{4\pi}{7}$
3. $\cos(\cot^{-1} x)$ is equal to ( $x \in \mathbf{R}$ )	(r) $\frac{\pi}{4}$
4. $\cos^{-1}\left(\cos\left(\frac{4\pi}{7}\right)\right)$ is equal to	(s) $\mathbf{R}$
5. $\tan^{-1}\left(\frac{x}{y}\right) - \tan^{-1}\left(\frac{x-y}{x+y}\right)$ is equal to ( $xy > 0$ )	(t) $0$



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229.  $\sin^{-1}(\sin y) = y$  if  $y$  lies in the interval

A.  $(0, \pi)$

B.  $\left(-\frac{\pi}{2}, \frac{\pi}{2}\right)$

C.  $-\pi, \pi$

D. none of these

**Answer:**



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230.  $\cos^{-1}\left(\frac{\sqrt{3}}{2}\right)$  is equal to

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

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

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

D. none of these

**Answer:**



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231. Domain of the function  $f(x) = \sin^{-1} x$  is equal to :

A. 0,1

B. R

C.  $-1, 1$

D. none of these

**Answer:**



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232. Domain of the function  $f(x) = \tan^{-1} x$  is equal to :

A.  $\left(0, \frac{\pi}{2}\right)$

B.  $\left(0, \frac{\pi}{2}\right)$

C.  $\left(-\frac{\pi}{2}, 0\right)$

D.  $\left(-\frac{\pi}{2}, \frac{\pi}{2}\right)$



**Answer:**



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**233.** Which of the following is the principal value branch of  $\cos^{-1} x$  ?

A.  $\left[ -\frac{\pi}{2}, \frac{\pi}{2} \right]$

B.  $(0, \pi)$

C.  $(0, \pi)$

D.  $(0, \pi) - \left\{ \frac{\pi}{2} \right\}$

**Answer:**



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**234.** Which of the following is the principal value branch of  $\cos^{-1} x$  ?

A.  $\left( -\frac{\pi}{2}, \frac{\pi}{2} \right)$

B.  $(0, \pi) - \left(\frac{\pi}{2}\right)$

C.  $\left(-\frac{\pi}{2}, \frac{\pi}{2}\right)$

D.  $\left(-\frac{\pi}{2}, \frac{\pi}{2}\right) - (0)$

**Answer:**



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**235.**  $\sin(\sin^{-1} x + \cos^{-1} x)$  is equal to  $(-1 \leq x \leq 1)$

A. 1

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

C. 0

D. none of these

**Answer:**



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236. If  $3 \tan^{-1} x + \cot^{-1} x = \pi$ , then x equals

A. 0

B. 1

C. -1

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

**Answer:**



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237. The value of  $\sin^{-1} \left( \cos \left( \frac{33\pi}{5} \right) \right)$  is

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

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

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

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

**Answer:**



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**238.**  $\sec^{-1} x = \cos^{-1} \left( \frac{1}{x} \right)$  holds true for

A.  $|x| \leq 1$

B.  $-1 \leq x \leq 0$

C.  $0 \leq x \leq$

D. none of these

**Answer:**



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**239.** If  $\cot^{-1} x = \tan^{-1} \left( \frac{1}{x} \right)$  for all  $x \in S$ , then find the set  $S$ .

A.  $x \neq 0$

B.  $x < 0$

C.  $|x| \leq 1$

D.  $x > 0$

**Answer:**

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**240.** The domain of the function  $\cos^{-1}(2x - 1)$  is

A.  $(0,1)$

B.  $(-1,1)$

C.  $[-1,1]$

D.  $(0, \pi)$

**Answer:**

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241. The domain of the function defined by  $f(x) = \sin^{-1} \sqrt{x-1}$  is

- A. [1,2]
- B. [-1,1]
- C. [0,1]
- D. none of these

**Answer:**

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242. If  $\cos \left( \sin^{-1} \left( \frac{2}{5} \right) + \cos^{-1} x \right) = 0$ , then  $x$  is equal to

- A.  $\frac{1}{5}$
- B.  $\frac{2}{5}$
- C. 0
- D. 1

**Answer:**



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**243.** The value of  $\sin(2 \tan^{-1}(.75))$  is equal to

- A. 0.96
- B. 0.75
- C. 1.5
- D.  $\sin 1.5$

**Answer:**



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

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

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

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

D.  $\frac{7\pi}{2}$

**Answer:**



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245. The value of expression  $2 \sec^{-1} 2 + \sin^{-1} \left( \frac{1}{2} \right)$  is

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

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

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

D. 1

**Answer:**



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246. If  $\tan^{-1} x + \tan^{-1} y = \frac{4\pi}{5}$ , then  $\cot^{-1} x + \cot^{-1} y$  equals

A.  $\pi$

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

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

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

**Answer:**



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247. The value of  $\cot \left[ \cos^{-1} \left( \frac{7}{25} \right) \right]$  is

A.  $\frac{25}{24}$

B.  $\frac{24}{25}$

C.  $\frac{7}{24}$

D.  $\frac{25}{7}$

**Answer:**



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**248.**  $\sec^{-1} x = \cos^{-1} \left( \frac{1}{x} \right)$  holds true for

A.  $|x| \leq 1$

B.  $|x| \leq 1$

C.  $|x| \geq 1$

D. none of these

**Answer:**



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**249.** If  $|x| \leq 1$ , then  $2 \tan^{-1} x + \sin^{-1} \left( \frac{2x}{1+x^2} \right)$  is equal to

A. 0

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

C.  $\pi$

D.  $4 \tan^{-1} x$ .

**Answer:**



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**250.** If  $\cos^{-1} \alpha + \cos^{-1} \beta + \cos^{-1} \gamma = 3\pi$ , then  $\alpha(\beta + \gamma) + \beta(\gamma + \alpha) + \gamma(\alpha + \beta)$  equals

A. 6

B. 0

C. 1

D. 12

**Answer:**



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251.  $\sin^{-1}(\cos x) = \frac{\pi}{2} - x$  is valid for

A.  $-\pi \leq x \leq 0$

B.  $0 \leq x \leq \pi$

C.  $-\frac{\pi}{2} \leq x \leq \frac{\pi}{2}$

D. none of these

**Answer:**



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252. The number of real solutions of the equation

$\sqrt{1 + \cos 2x} = \sqrt{2} \cos^{-1}$  in  $[\pi/2, \pi)$  is

A. 0

B. 1

C. 2

D. infinite

**Answer:**

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**253.** If  $\cos^{-1} x > \sin^{-1} x$ , then

A.  $0 \leq x < \frac{1}{\sqrt{2}}$

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

C.  $x > 0$

D.  $\frac{1}{\sqrt{2}} < x \leq 1$

**Answer:**

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**254.** Find the values of  $\tan^2(\sec^{-1} 2) + \cot^2(\cos^{-1} 3)$

A. 5

B. 13

C. 11

D. 15

**Answer:**

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**255.** If  $\alpha \leq 2 \sin^{-1} x + \cos^{-1} x \leq \beta$ , then

A.  $\alpha = -\frac{\pi}{2}, \beta = \frac{\pi}{2}$

B.  $\alpha = 0, \beta = \pi$

C.  $\alpha = \frac{\pi}{2}, \beta = \frac{3\pi}{2}$

D.  $\alpha = 0, \beta = 2\pi$

**Answer:**

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256. Find the solution of the equation:

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

- A. a unique solution
- B. no solution
- C. two solutions
- D. infinitely many solutions.

**Answer:**



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

- A. all  $x, y \in \mathbb{R}$
- B.  $|x|, > 1, |y|, < 1$

C.  $|x| > 1, |y| > 1$

D.  $xy > -1$

**Answer:**



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258. The value of the expression  $\sin[\cot^{-1}(\cos(\tan^{-1} 1))]$  is

A. 0

B. 1

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

D.  $\frac{1}{\sqrt{3}}$

**Answer:**



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259. If  $\sin^{-1} x + \sin^{-1} y = \frac{\pi}{2}$ , then value of  $\cos^{-1} x + \cos^{-1} y$

A. 0

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

C.  $\pi$

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

**Answer:**



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260. The value of  $\sin(2 \sin^{-1}(.6))$  is

A. 0.48

B. 1.2

C. 0.96

D.  $\sin 1.2$

**Answer:**



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**261.** The domain of the function  $\sin^{-1} x + \cos x$  is

A.  $[-1,1]$

B.  $(-\infty, \infty)$

C.  $[-1, \pi + 1]$

D.  $\{\}$

**Answer:**



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**262.**  $\tan^{-1} 1 + \tan^{-1} 2 + \tan^{-1} 3 =$

A. 0

B.  $\pi$

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

D. none of these

**Answer:**



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**263.** The domain of  $y = \cos^{-1}(x^2 - 4)$  is

A.  $[3, 5]$

B.  $[0, \pi]$

C.  $[-\sqrt{5}, -\sqrt{3}] \cup [\sqrt{3}, \sqrt{5}]$

D.  $[-\sqrt{5}, -\sqrt{3}] \cup [\sqrt{3}, \sqrt{5}]$

**Answer:**



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264. The domain of the function  $y = \sin^{-1}(-x^2)$  is

A.  $[0,1]$

B.  $[-1,1]$

C.  $(0,1)$

D.  $\phi$

**Answer:**



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265. Let  $\theta = (\sin^{-1} \sin(-600^\circ))$ , then value of  $\theta$  is

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

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

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

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

**Answer:**



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266. If  $\tan^{-1} x = \frac{\pi}{10}$  for some  $x \in \mathbb{R}$ , then the value of  $\cot^{-1} x$  is

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

B.  $\frac{2\pi}{5}$

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

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

**Answer:**



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

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

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

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

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

**Answer:**



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**268.** The domain of  $\sin^{-1} 2x$  is

A.  $[0,1]$

B.  $[-1,1]$

C.  $[-2,2]$

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

**Answer:**



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269. Domain of the function  $\sin^{-1}\left(\frac{2x+1}{3}\right)$  is

A.  $(-2,1)$

B.  $[-2,1]$

C.  $(-2,0)$

D.  $[-1,1]$

**Answer:**



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

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

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

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

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

**Answer:**



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**271.** The principal value branch of  $\sec^{-1}$  is

A.  $\left[-\frac{\pi}{2}, \frac{\pi}{2}\right] - \{0\}$

B.  $[0, \pi] - \left\{\frac{\pi}{2}\right\}$

C.  $(0, \pi)$

D.  $\left(-\frac{\pi}{2}, \frac{\pi}{2}\right)$

**Answer:**



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**272.** One branch of  $\cos^{-1}$  other than the principal value branch corresponds to



A.  $\left[ \frac{\pi}{2}, \frac{3\pi}{2} \right]$

B.  $[\pi, 2\pi] - \left\{ 3\frac{\pi}{2} \right\}$

C.  $(0, \pi)$

D.  $[2\pi, 3\pi]$

**Answer:**



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273. If  $\sin^{-1}\left(2\frac{a}{1+a^2}\right) + \cos^{-1}\left(\frac{1-a^2}{1+a^2}\right) = \tan^{-1}\left(\frac{2x}{1-x^2}\right)$ , where

$a, x \in (0,1)$ , then the value of  $x$  is

A. 0

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

C.  $a$

D.  $2\frac{a}{1-a^2}$

**Answer:**



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

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

B.  $\pi$

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

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

Answer:



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

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

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

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

D. 1

**Answer:**



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276.  $\sin(\tan^{-1} x), |x| < 1$  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:**



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277.  $\sin^{-1}\left(\frac{4}{5}\right) + \sin^{-1}\left(\frac{5}{13}\right)$  is equal to

A.  $\sin^{-1}\left(\frac{16}{65}\right)$

B.  $-\sin^{-1}\left(\frac{16}{65}\right)$

C.  $\cos^{-1}\left(\frac{16}{65}\right)$

D. none of these

**Answer:**



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

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

B. 0

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

D.  $2\sqrt{3}$

**Answer:**

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

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

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

C.  $0 < y < \pi$

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

**Answer:**

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