MATHS

BOOKS - RD SHARMA MATHS (HINGLISH)

INVERSE TRIGONOMETRIC FUNCTION

Solved Examples And Exercises

1. Evaluate: (i) $\cos\left\{\sin^{-1}\left(-\frac{7}{25}\right)\right\}$ (ii) $\sec\left\{\cot^{-1}\left(-\frac{5}{12}\right)\right\}$ (iii) $\cot\left\{\sec^{-1}\left(-\frac{13}{5}\right)\right\}$

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

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3. Prove the following:

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

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4. If $\tan^{-1}\left\{\frac{\sqrt{1+x^2}-\sqrt{1-x^2}}{\sqrt{1+x^2}+\sqrt{1-x^2}}\right\}=\alpha$, then prove that $x^2=\sin 2\alpha$

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5. if, $\sin^{-1}x+\sin^{-1}y+\sin^{-1}z=\pi$ then prove that $x\sqrt{1-x^2}+y\sqrt{1-y^2}+z\sqrt{1-z^2}=2xyz.$

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6. If $x=\cos ec\left[\tan^{-1}\left\{\cos\left(\cot^{-1}\left(\sec\left(\sin^{-1}a\right)\right)\right)\right\}\right]$ and $y=\sec\left[\cot^{-1}\left\{\sin\left(\tan^{-1}\left(\cos ec\left(\cos^{-1}a\right\}\right]\right.\right.\right.$

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7. Evaluate: $\sin\left\{\tan^{-1}\left(\frac{7}{24}\right)\right\}$

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8. Solve: $\cos\left\{2\sin^{-1}(-x)\right\} = 0$

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9. Solve : $\cos\left(\sin^{-1}x\right) = \frac{1}{6}$

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10. Prove the following results: $\tan\left(\cos^{-1}\left(\frac{4}{5}\right) + \tan^{-1}\left(\frac{2}{3}\right)\right) = \frac{17}{6}$

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11. If $a, b, c > 0$ and $s = \frac{a+b+c}{2}$, *provethat*

$$\tan^{-1}\sqrt{\frac{2as}{bc}} + \tan^{-1}\sqrt{\frac{2bs}{ca}} + \tan^{-1}\sqrt{\frac{2cs}{ab}} = \pi$$

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12. If

$x^2 + y^2 + z^2 = r^2$, *then* $\tan^{-1}\left(\frac{xy}{zr}\right) + \tan^{-1}\left(\frac{yz}{xr}\right) + \tan^{-1}\left(\frac{xz}{yr}\right)$ is equal to π (b) $\frac{\pi}{2}$ (c) 0 (d) none of these

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13. If $c_j > 0$ for $i = 1, 2, \ldots . , n$ prove that

$$\tan^{-1}\left(\frac{c_1 x - y}{c_1 y + x}\right) + \tan^{-1}\left(\frac{c_2 - c_1}{1 + c_2 c_1}\right) + \tan^{-1}\left(\frac{c_3 - c_2}{1 + c_3 c_2}\right) + \ldots\ldots\ldots +$$

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14. Evaluate: $\tan^{-1}\left(\frac{3\sin 2\alpha}{5 + 3\cos 2\alpha}\right) + \tan^{-1}\left(\frac{1}{4}\tan\alpha\right)$,

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15. Prove that: $\sum_{m=1}^{n} \tan^{-1}\left(\frac{2m}{m^4+m^2+2}\right) = \tan^{-1}\left(\frac{n^2+n}{n^2+n+2}\right)$

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16. Sum the following series to infinity:

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

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17. Solve the equation: $\tan^{-1}\sqrt{x^2+x} + \sin^{-1}\sqrt{x^2+x+1} = \frac{\pi}{2}$

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18. If a_1, a_2, a_3, a_n are in arithmetic progression with common difference d, then evaluate the following expression:

$$\tan\left\{\tan^{-1}\left(\frac{d}{1+a_1a_2}\right)+\tan^{-1}\left(\frac{d}{1+a^2a_3}\right)+\tan^{-1}\left(\frac{d}{1+a_3a_4}\right)++\right.$$

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19. Prove that:

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

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20. If $x>y>z>0$, then find the value of

$$\frac{\cot^{-1}(xy+1)}{x-y}+\frac{\cot^{-1}(yz+1)}{zy-z}+\frac{\cot^{-1}(zx+1)}{z-x}$$

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21. Find the maximum and minimum values of $\left(\sin^{-1}x\right)^3+\left(\cos^{-1}x\right)^3$, where $-1\leq x\leq 1$.

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

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23. Solve : $4\sin^{-1} x = \pi - \cos^{-1} x$

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24. If $\left(\sin^{-1} x\right)^2 + \left(\cos^{-1} x\right)^2 = \frac{17\pi^2}{36}$, find x.

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25. Prove that : $\tan^{-1} 2 + \tan^{-1} 3 = \frac{3\pi}{4}$

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

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

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

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29. Prove that: $\frac{\tan^{-1}1}{7}+\frac{\tan^{-1}1}{13}=\frac{\tan^{-1}2}{9}$

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

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

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

$\cot^{-1}7+\cot^{-1}8+\cot^{-1}18=\frac{\cot^{-1}1}{13}$

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30. If $\tan^{-1} 2 + \tan^{-1} 3 + \theta = \pi,$ find the value of θ.

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

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32. Find the minimum value of n for which $\tan^{-1}\left(\frac{n}{\pi}\right) > \frac{\pi}{4}, n \in N$.

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33. Find the principal values of $\frac{\sec^{-1} 2}{\sqrt{3}}$ and $\sec^{-1}(-2)$

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34. Find the domain of $\sec^{-1}(2x+1)$

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

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36. If $x, y, z \in [-1, 1]$ such that $\cos^{-1}x + \cos^{1}y + \cos^{-1}z = 3\pi$, then find the values of (1) $xy + yz + zy$ and (2) $x(y+z) + y(z+x) + z(x+y)$

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

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38. For the principal values, evaluate each of the following: $\tan^{-1}\left\{2\cos\left(2\sin^{-1}\left(\frac{1}{2}\right)\right)\right\}$ and

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

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39. For the principal values, evaluate each of the following: $\tan^{-1}\sqrt{3}-\sec^{-1}(-2)+\cos ec^{-1}\frac{2}{\sqrt{3}}\ 2\sec^{-1}(2)-2\cos ec^{-1}(-2)$

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40. Find the domain of $\sec^{-1}(3x-1)+\sec^{-1}x-\tan^{-1}x$

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41. Show that $\cos^{-1}\left(\frac{\cos\alpha+\cos\beta}{1+\cos\alpha\cos\beta}\right)=2\tan^{-1}\left(\tan\left(\frac{\alpha}{2}\right)\tan\left(\frac{\beta}{2}\right)\right)$

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42. Show taht

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

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43. Prove the following: $4\frac{\tan^{-1}1}{5}-\frac{\tan^{-1}1}{70}+\frac{\tan^{-1}1}{99}=\frac{\pi}{4}$

$$2tan^{-1}\frac{1}{5}+sec^{-1}\frac{5\sqrt{2}}{7}+2\frac{\tan^{-1}1}{8}=\frac{\pi}{4}$$

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44. Evaluate: $\tan\left\{\frac{1}{2}\cos^{-1}\left(\frac{\sqrt{5}}{3}\right)\right\}$

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45. $\sin^{-1}(1-x) - 2\sin^{-1} x = \frac{\pi}{2}$, then x is equal to (A) $0, \frac{1}{2}$ (B) $1, \frac{1}{2}$ (C) 0 (D) $\frac{1}{2}$

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46. If $y = \cot^{-1}\left(\sqrt{\cos x}\right) - \tan^{-1}\left(\sqrt{\cos x}\right)$, prove that $\sin y = \frac{\tan^2 x}{2}$

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47. Evaluate: $\tan\left(2\tan^{-1}\left(\frac{1}{5}\right)\right)$

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

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

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

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

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52. If $x, y, z \in [-1, 1]$ such that $\sin^{-1} x + \sin^{-1} y + \sin^{-1} z = -\frac{3\pi}{2}$, find the value of $x^2 + y^2 + z^2$.

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53. Find the domain of the function $f(x) = \sin^{-1}\sqrt{x-1}$

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54. Find the domain of $f(x) = \sin^{-1}x + \cos x$.

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

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56. Find the domain of the function $f(x) = \sin^{-1}(2x-3)$

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

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58. If $\sin^{-1} x + \sin^{-1} y + \sin^{-1} z = \frac{3\pi}{2}$, find the value of $x^2 + y^2 + z^2$

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59. Find the domain of function: $f(x) = \sin^{-1} \sqrt{x^2 - 1}$

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

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61. Solve the equation:

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

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

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63. If $\cos^{-1}\left(\frac{x}{a}\right) + \cos^{-1}\left(\frac{y}{b}\right) = \alpha$, prove that $\frac{x^2}{a^2} - 2\frac{xy}{ab}\cos\alpha + \frac{y^2}{b^2} = \sin^2\alpha$

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

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65. Solve the following equations: $\frac{\sin^{-1}(3x)}{5} + \frac{\sin^{-1}(4x)}{5} = \sin^{-1} x$

$\sin^{-1} 6x + \sin^{-1} 6\sqrt{3}x = \frac{\pi}{2}$

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

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67. The value of $\tan^{-1}\left(\frac{1}{3}\right)+\tan^{-1}\left(\frac{2}{9}\right)+\tan^{-1}\left(\frac{4}{33}\right)+\tan^{-1}\left(\frac{8}{129}\right)+\ldots. n$ terms is:

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

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69. Prove that:

$$\tan^{-1}\left(\frac{1}{2}\tan 2A\right)+\tan^{-1}(\cot a)+\tan^{-1}\left(\cot^3 A\right)=$$

$$\left\{0, \quad \text{if} \quad \frac{\pi}{4}<a<\frac{\pi}{2}\pi, \quad \text{if} \quad 0<A<\frac{\pi}{4}\right\}$$

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

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71. Solve the following equation for x: $\cos\left(\tan^{-1}x\right)=\sin\left(\frac{\cot^{-1}3}{4}\right)$

,and

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

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72. Write each of the following in the simplest form: $\cot^{-1}\left\{\frac{a}{\sqrt{x^2-a^2}}\right\}, |x| > a$

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73. Evaluate: $\sin\left(\cot^{-1} x\right)$ (ii) $\cos\left(\tan^{-1} x\right)$

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74. Simplify each of the following: $\sin^{-1}\left(\frac{\sin x + \cos x}{\sqrt{2}}\right)$

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75. Evaluate the following: $\sin^{-1}(\sin 10)$

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76. Prove that: $\sec^2\left(\tan^{-1}2\right)+\cos ec^2\left(\cot^{-1}3\right)=15$ and $\tan^2\left(\sec^{-1}2\right)+\cot^2\left(\cos ec^{-1}3\right)=11$

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

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

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78. Evaluate: $\sin\left(\frac{\cos^{-1}3}{5}+\cos ec^{-1}\frac{13}{5}\right)$

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79. Find the value of the expression $\sin\left[\cot^{-1}\left\{\cos\left(\tan^{-1}1\right)\right\}\right]$

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

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

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

C. -1

D. 1

Answer: D

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

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82. 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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83. Solve the following equation for x:

$$\tan^{-1}\left(\frac{1}{4}\right)+2\tan^{-1}\left(\frac{1}{5}\right)+\tan^{-1}\left(\frac{1}{6}\right)+\tan^{-1}\left(\frac{1}{x}\right)=\frac{\pi}{4}$$

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

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85. Write the value of $\sin^{-1}(\sin 1550^\circ)$

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86. Prove that:

$$\tan^{-1}\left\{\frac{\cos 2\alpha\sec 2\beta+\cos 2\beta\sec 2\alpha}{2}\right\}=\tan^{-1}\{\tan^2(\alpha+\beta)\tan^2(\alpha-\beta)$$

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87. Prove that:

$$\frac{\alpha^3}{2}\cos ec^2\left(\frac{1}{2}\frac{\tan^{-1}\alpha}{\beta}\right)+\frac{\beta^2}{2}\sec^2\left(\frac{1}{2}\frac{\tan^{-1}\beta}{\alpha}\right)=(\alpha+\beta)(a^2+\beta^2).$$

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88. Show that $:2\tan^{-1}x+\frac{\sin^{-1}(2x)}{1+x^2}$ is constant for $x\geq 1$, find that constant.

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89. Prove that: $\tan^{-1}\left(\frac{1-x^2}{2x}\right)+\cot^{-1}\left(\frac{1-x^2}{2x}\right)=\frac{\pi}{2}$

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90. Simplify each of the following: $\cos^{-1}\left(\frac{3}{5}\cos x+\frac{4}{5}\sin x\right)$, where $-\frac{3\pi}{4}\leq x\leq\frac{\pi}{4}$

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91. Write the following functions in the simplest form:

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

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92. Evaluate each of the following:

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

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

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

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93. For the principal values, evaluate the following:

$$\cot^{-1}(-1)+\cos ec^{-1}\left(-\sqrt{2}\right)+secs^{-1}(2)$$

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

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94. Prove that: $(i)\tan^{-1}\left\{\frac{\sqrt{1+\cos x}+\sqrt{1-\cos x}}{\sqrt{1+\cos x}-\sqrt{1-\cos x}}\right\} = \frac{\pi}{4} + \frac{x}{2},$

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95. Evaluate each of the following: $\sin^{-1}\left(s \in \frac{\pi}{3}\right)$ (ii) $\cos^{-1}\left(\frac{\cos(2\pi)}{3}\right)$ $\tan^{-1}\left(\frac{\tan\pi}{4}\right)$ (iv) $\sin^{-1}\left(\frac{\sin(2\pi)}{3}\right)$ $\cos^{-1}\left(\frac{\cos(7\pi)}{7}\right)$ (vi) $\tan^{-1}\left(\frac{\tan(3\pi)}{4}\right)$ $\sin^{-1}(\cos(-600^0))$ $\cos^{-1}(\cos(-680^0))$

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96. If $\cos ec^{-1}x + \cos ec^{-1}y + \cos ec^{-1}z = -\frac{3\pi}{2}$, find the value of $\frac{x}{y} + \frac{y}{z} + \frac{z}{x}$.

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97. For the principal values, evaluate each of the following:

$\tan^{-1}\sqrt{3} - \sec^{-1}(-2) + \cos ec^{-1}\frac{2}{\sqrt{3}}$

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

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98. Find the principal values of $\cot^{-1}\sqrt{3}$ and $\cot^{-1}(-1)$

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99. For the principal values, evaluate the following:

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

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

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

$\cos ec^{-1}\left(\frac{2\tan(11\pi)}{6}\right)$

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100. The value of $\tan\left\{\frac{\cos^{-1}1}{5\sqrt{2}}-\frac{\sin^{-1}4}{\sqrt{17}}\right\}$ is $\frac{\sqrt{29}}{3}$ (b) $\frac{29}{3}$ (c) $\frac{\sqrt{3}}{29}$ (d) $\frac{3}{29}$

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101. $\sin\left(\cot^{-1}\left(\tan\left(\cos^{-1}x\right)\right)\right)$ is equal to a) x b) $\sqrt{1-x^2}$ c) $\frac{1}{x}$ d) none of these

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

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103. Write the principal value of $\cos^{-1}\left(\cos 680^0\right)$.

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

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105. Write the principal value of $\cos^{-1}\left(\frac{\cos(2\pi)}{3}\right) + \sin^{-1}\left(s \in \frac{2\pi}{3}\right)$

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106. If $\tan^{-1}\left(\sqrt{3}\right) + \cot^{-1} x = \frac{\pi}{2}, then f \in dx$.

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

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

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109. Evaluate: $\sin^{-1}\left(s\in\frac{3\pi}{5}\right)$

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110. If $\left(\tan^{-1}x\right)^2+\left(\cot^{-1}x\right)^2=\frac{5\pi^2}{8}$, then the value of x is

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

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112. Evaluate: (i) $\tan\left\{\cos^{-1}\left(-\frac{7}{25}\right)\right\}$ (ii) $\mathrm{cosec}\left\{\cot^{-1}\left(-\frac{12}{5}\right)\right\}$

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113. Evaluate: $\sin\left\{\cos^{-1}\left(-\frac{3}{5}\right)+\cot^{-1}\left(-\frac{5}{12}\right)\right\}$

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114. If $-1 \leq x, y \leq 1$ such that $\sin^{-1} x + \sin^{-1} y = \frac{2\pi}{3}$, find the value of $\cos^{-1} x + \cos^{-1} y$.

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

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116. If $\tan^{-1} x - \cot^{-1} x = \tan^{-1} \frac{1}{\sqrt{3}}$ find the value of x.

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117. If $\sin\left(\cos^{-1}\left(\frac{5}{13}\right) + \sin^{-1} x\right) = 1$ find the value of x.

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118. If $\cos\left(\sin^{-1}\left(\frac{2}{5}\right) + \cos^{-1} x\right) = 0$ find the value of x.

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119. Evaluate : $\cos\left(2\cos^{-1} x + \sin^{-1} x\right) atx = \frac{1}{5}$

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120. Let $f(x) = e^{\cos^{-1}\left\{\sin\left(x+\frac{\pi}{3}\right)\right\}}$ Then, $f\left(\frac{8\pi}{9}\right) =$ (a)$e^{5\pi/18}$ (b) $e^{13\pi/18}$ (c) $e^{-2\pi/18}$ (d) none of these

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121. If $u = \cot^{-1}\sqrt{\tan\alpha} - \tan^{-1}\sqrt{\tan\alpha}, then \tan\left(\frac{\pi}{4} - \frac{u}{2}\right)$ is equal to (a)$\sqrt{\tan\alpha}$ (b) $\sqrt{\cot\alpha}$ (c)$\tan\alpha$ (d) $\cot\alpha$

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122. The number of real solutions of the equation $\sqrt{1+\cos 2x} = \sqrt{2}\sin^{-1}(\sin x), \ -\pi \leq x \leq \pi$ is 0 (b) 1 (c) 2 (d) infinite

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123. If $\alpha = \tan^{-1}\left(tan\frac{5\pi}{4}\right) and \beta = \tan^{-1}\left(-\frac{\tan(2\pi)}{3}\right), then$ $4\alpha = 3\beta$ (b) $3\alpha = 4\beta$ (c) $\alpha - \beta = 74\alpha = \frac{3\beta}{12}$ none of these

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124. The domain of $\cos^{-1}\left(x^2-4\right)$ is (a) [3,5] (b) $[-1,1]$ (c) $[-\sqrt{5},-\sqrt{3}]\cup[\sqrt{3},\sqrt{5}]$ (d) $-\sqrt{5},-\sqrt{3}]\cap[-\sqrt{5},\sqrt{3}]$

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125. In a ABC, , if C is a right angle, then $\tan^{-1}\left(\frac{a}{b+c}\right)+\tan^{-1}\left(\frac{b}{c+a}\right)=$ $\frac{\pi}{3}$ (b) $\frac{\pi}{4}$ (c) $\frac{5\pi}{2}$ (d) $\frac{\pi}{6}$

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126. If $3\sin^{-1}\left(\frac{2x}{1+x^2}\right)-4\cos^{-1}\left(\frac{1-x^2}{1+x^2}\right)+2\tan^{-1}\left(\frac{2x}{1-x^2}\right)=\frac{\pi}{3}$, then x is equal to (A) $\frac{1}{\sqrt{3}}$ (B) $-\frac{1}{\sqrt{3}}$ (C) $\sqrt{3}$ (D) - $\frac{\sqrt{3}}{4}$

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127. Solve the following equations: $\sin\left[2\cos^{-1}\left\{\cot\left(2\tan^{-1}x\right)\right\}\right]=0$

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128. Solve the equation of $x:\sin^{-1}x+\sin^{-1}(1-x)=\cos^{-1}x$

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

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

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131. 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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132. Solve the following equation for x :

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

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133. Solve the following equation for x:

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

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

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

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136. Find the principal values of (a) $\sin^{-1}\left(\frac{\sqrt{3}}{2}\right)$ (b) $\sin^{-1}\left(-\frac{1}{2}\right)$

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

A. (a) $\frac{\pi}{2}$

B. (b) $\frac{\pi}{3}$

C. (c) $\frac{\pi}{4}$

D. (d) $\frac{\pi}{6}$

Answer: (d) $\frac{\pi}{6}$

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

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139. Find the domain of the function $f(x) = \sin^{-1}(2x - 3)$.

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140. Find the domain of $f(x) = \sin^{-1}\left(-x^2\right)$.

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141. Find the domain of $f(x) = \sin^{-1} x + \cos x$

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142. Find the domain of the function $f(x) = \sin^{-1}\sqrt{x - 1}$

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143. If $x, y, z \in [-1, 1]$ such that $\sin^{-1} x + \sin^{-1} y + \sin^{-1} z = -\frac{3\pi}{2}$, find the value of $x^2 + y^2 + z^2$

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144. Let $x, y, z \in [-1, 1]$ such that $\sin^{-1} x + \sin^{-1} y + \sin^{-1} z = \frac{3\pi}{2}$. Find the value of $x^{2018} + y^{2019} + z^{2020}$

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145. Let $x, y, z \in [-1, 1]$ such that $\sin^{-1} x + \sin^{-1} y + \sin^{-1} z = \frac{3\pi}{2}$. Find the value of $x^{2016} + y^{2018} + z^{2020} - \frac{9}{x^{2016} + y^{2018} + z^{2020}}$

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

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

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

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

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

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

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

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

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148. If $\tan^{-1} x = y$ then

A. (a) $-1 < y < 1$

B. (b) $y = \left[-\frac{\pi}{2}, \frac{\pi}{2}\right]$

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

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

Answer: (b) $y = \left[-\frac{\pi}{2}, \frac{\pi}{2}\right]$

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

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150. Find the domain of each of the following functions:

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

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

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151. Find the domain of each of the following functions:

(i) $f(x) = \sin^{-1}\sqrt{x^2 - 1}$

(ii) $f(x) = \sin^{-1} x + \sin^{-1} 2x$

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152. If $\sin^{-1} x + \sin^{-1} y + \sin^{-1} z + \sin^{-1} t = 2\pi$, then find the value of $x^2 + y^2 + z^2 + t^2$.

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153. If $\left(\sin^{-1} x\right)^2 + \left(\sin^{-1} y\right)^2 + \left(\sin^{-1} z\right)^2 = \frac{3}{4}\pi^2$, find the value of $x^2 + y^2 + z^2$.

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

A. $x \in [0, 1]$

B. $x \in [-1, 0]$

C. $x \in \left[-\frac{1}{2}, 0\right]$

D. $x \in \left[0, \frac{1}{2}\right]$

Answer: A

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

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

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157. If $x,\ y,\ z \in [-1, 1]$ such that $\cos^{-1} x + \cos^{-1} y + \cos^{-1} z = 0$, find $x + y + z$.

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158. If $x, y, z \in [-1, 1]$ such that $\cos^{-1} x + \cos^{1} y + \cos^{-1} z = 3\pi$, then find the values of (1) $xy + yz + zy$ and (2) $x(y + z) + y(z + x) + z(x + y)$

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159. If $x, y, z \in [-1, 1]$ such that $\cos^{-1} x + \cos^{1} y + \cos^{-1} z = 3\pi$, then find the values of (1) $xy + yz + zy$ and (2) $x(y + z) + y(z + x) + z(x + y)$

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160. Find the domain of definition of $f(x) = \cos^{-1}(x^2 - 4)$.

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161. Find the domain of $f(x) = 2\cos^{-1} 2x + \sin^{-1} x$.

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162. Find the domain of $f(x) = \cos^{-1} x + \cos x$.

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163. 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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164. Find the principal value of each of the following: $\cos^{-1}\left(\frac{\sin(4\pi)}{3}\right)$

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

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165. For the principal values, evaluate each of the following : $\frac{\cos^{-1}1}{2}+2\frac{\sin^{-1}1}{2}$ (ii) $\cos^{-1}\left(\frac{1}{2}\right)-2\sin^{-1}\left(-\frac{1}{2}\right)$

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166. For the principal values, evaluate each of the following : $\sin^{-1}\left(-\frac{1}{2}\right)+2\cos^{-1}\left(-\frac{\sqrt{3}}{2}\right)$ (ii) $\sin^{-1}\left(-\frac{\sqrt{3}}{2}\right)+\cos^{-1}\left(\frac{\sqrt{3}}{2}\right)$

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

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

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

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

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171. For the principal values, evaluate each of the following:

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

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172. For the principal values, evaluate each of the following:

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

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

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174. Find the minimum value of n for which $\tan^{-1}\left(\frac{n}{\pi}\right) > \frac{\pi}{4}, n \in N$.

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

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

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177. For the principal value, evaluate $\tan^{-1}(-1)+\cos^{-1}\left(-\frac{1}{\sqrt{2}}\right)$

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178. For the principal value, evaluate $\tan^{-1}\left\{2\sin\left(4\frac{\cos^{-1}\left(\sqrt{3}\right)}{2}\right)\right\}$

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

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

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181. Evaluate: $\tan^{-1}\left(\tan\left(\frac{5\pi}{6}\right)\right)+\cos^{-1}\left\{\cos\left(\left(\frac{13\pi}{6}\right)\right)\right\}$

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182. Find the principal value of $\sec^{-1}(2)$

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

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

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

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186. Find the domain of $\sec^{-1}(2x+1)$.

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187. Find the principal values of each of the following: $\sec^{-1}(-\sqrt{2})$ (ii) $\sec^{-1}(2)$

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188. Find the principal values of each of the following: $\sec^{-1}\left(2\sin\left(\frac{3\pi}{4}\right)\right)$ (ii) $\sec^{-1}\left(2\tan\left(\frac{3\pi}{4}\right)\right)$

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189. For the principal value, evaluate $\tan^{-1}\sqrt{3} - \sec^{-1}(-2)$

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190. For the principal value, evaluate $\sin^{-1}\left(-\frac{\sqrt{3}}{2}\right) - 2\sec^{-1}\left(2\tan\left(\frac{\pi}{6}\right)\right)$

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191. Find the domain of $\sec^{-1}(3x-1)$ (ii) $\sec^{-1}x - \tan^{-1}x$

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192. Find the domain of $\sec^{-1}(3x-1)$ (ii) $\sec^{-1}x - \tan^{-1}x$

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193. Find the principal values of $\mathrm{cosec}^{-1}(2)$ and $\mathrm{cosec}^{-1}\left(-\frac{2}{\sqrt{3}}\right)$

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194. Find the set of values of $\mathrm{cosec}^{-1}\left(-\frac{1}{2}\right)$.

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195. For the principal values, evaluate the following:

$\cot^{-1}(-1) + \cos ec^{-1}(-\sqrt{2}) + secs^{-1}(2)$

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

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196. For the principal values, evaluate each of the following:

$\tan^{-1}\sqrt{3} - \sec^{-1}(-2) + \cos ec^{-1}\frac{2}{\sqrt{3}}\ 2\sec^{-1}(2) - 2\cos ec^{-1}(-2)$

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197. If $\mathrm{cosec}^{-1}x + \mathrm{cosec}^{-1}y + \mathrm{cosec}^{-1}z = -\frac{3\pi}{2}$, find the value of $\frac{x}{y} + \frac{y}{z} + \frac{z}{x}$.

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198. Find the principal values of each of the following:

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

(ii) $\text{cosec}^{-1}(-2)$

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199. Find the principal values of each of the following: (i) $\text{cosec}^{-1}\left(\frac{2}{\sqrt{3}}\right)$ (ii) $\text{cosec}^{-1}\left(2\cos\left(\frac{2}{3}\pi\right)\right)$

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200. Find the set of values of $\text{cosec}^{-1}\left(\frac{\sqrt{3}}{2}\right)$

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201. For the principal values, evaluate the following:

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

$$\sec^{-1}(\sqrt{2})+2\cos ec^{-1}(-\sqrt{2}) \qquad \sin^{-1}\left[\cos\left\{2\cos ec^{-1}(-2)\right\}\right]$$

$$\cos ec^{-1}\left(2\frac{\tan(11\pi)}{6}\right)$$

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202. For the principal values, evaluate the following:

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

$$\sec^{-1}(\sqrt{2})+2\cos ec^{-1}(-\sqrt{2}) \qquad \sin^{-1}\left[\cos\left\{2\cos ec^{-1}(-2)\right\}\right]$$

$$\cos ec^{-1}\left(2\frac{\tan(11\pi)}{6}\right)$$

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203. Find the set of values of $\cot^{-1}(1)$ and $\cot^{-1}(-1)$

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204. Find the principal values of $\cot^{-1}\sqrt{3}$ and $\cot^{-1}(-1)$

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205. For the principal values, evaluate the following:

$\cot^{-1}(-1)+\cos ec^{-1}(-\sqrt{2})+secs^{-1}(2)$

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

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206. For the principal values, evaluate the following:

$\cot^{-1}(-1)+\cos ec^{-1}(-\sqrt{2})+secs^{-1}(2)$

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

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

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208. Find the principal values of each of the following:

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

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

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209. Find the domain of $\cot x + \cot^{-1} x$

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210. Evaluate each of the following: (i) $\cot^{-1}\left(\frac{1}{\sqrt{3}}\right) - \operatorname{cosec}^{-1}(-2) + \sec^{-1}\left(\frac{2}{\sqrt{3}}\right)$ (ii) $\cot^{-1}\left\{2\cos\left(\sin^{-1}\left(\frac{\sqrt{3}}{2}\right)\right)\right\}$

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211. Evaluate each of the following: (i) $\operatorname{cosec}^{-1}\left(-\frac{2}{\sqrt{3}}\right) + 2\cot^{-1}(-1)$ (ii) $\tan^{-1}\left(-\frac{1}{\sqrt{3}}\right) + \cot^{-1}\left(\frac{1}{\sqrt{3}}\right) + \tan^{-1}\left(\sin\left(-\frac{\pi}{2}\right)\right)$

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212. Evaluate each of the following: $\sin^{-1}\left(\frac{\sin\pi}{3}\right)$ (ii) $\cos^{-1}\left(\frac{\cos(2\pi)}{3}\right)$ (iii) $\tan^{-1}\left(\frac{\tan\pi}{4}\right)$

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213. Evaluate each of the following: $\sin^{-1}\left(\frac{\sin(2\pi)}{3}\right)$ (ii) $\cos^{-1}\left(\frac{\cos(7\pi)}{6}\right)$ (iii) $\tan^{-1}\left(\frac{\tan(3\pi)}{4}\right)$

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214. Evaluate each of the following: (i)$\sin^{-1}(\sin(-600^o))$ (ii) $\cos^{-1}(\cos(-680^o))$

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215. Express each of the following in the simplest form: `tan^(-1){sqrt((1-cosx)/(1+cosx))},\ -pi

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216. Express each of the following in the simplest form: `tan^(-1){(cosx)/(1-sinx)},\ -pi/2

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217. Prove that: $(i)\tan^{-1}\left\{\frac{\sqrt{1+\cos x}+\sqrt{1-\cos x}}{\sqrt{1+\cos x}-\sqrt{1-\cos x}}\right\}=\frac{\pi}{4}+\frac{x}{2},$

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218. 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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219. Prove that:

$\tan^{-1}\left\{\frac{\sqrt{1+\cos x}+\sqrt{1-\cos x}}{\sqrt{1+\cos x}-\sqrt{1-\cos x}}\right\}=\frac{\pi}{4}-\frac{x}{2}, \quad \text{if} \quad \pi<x<3\frac{\pi}{2}$

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220. Prove that: `cot^(-1){(sqrt(1+sinx)+sqrt(1-sinx))/(sqrt(1+sinx)-sqrt(1-sinx))}=pi/2-x/2,\ ifpi/2

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221. Write the following functions in the simplest form: (i) $\tan^{-1}\left\{\frac{x}{\sqrt{a^2-x^2}}\right\}, \quad -a<x<a$ (ii) $\tan^{-1}\left\{\sqrt{\frac{a-x}{a+x}}\right\}, \quad -a<x<a$

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222. Write the following functions in the simplest form: (i) $\sin^{-1}\left\{\frac{x}{\sqrt{x^2+a^2}}\right\}$ (ii) $\cos^{-1}\left\{\frac{x}{\sqrt{x^2+a^2}}\right\}$

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223. Prove that: `tan^(-1){(sqrt(1+x)-sqrt(1-x))/(sqrt(1+x)+sqrt(1-x))}=pi/4-1/2\ cos^(-1)x ,\ \ 0

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224. 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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225. Simplify each of the following: $\cos^{-1}\left(\frac{3}{5}\cos x+\frac{4}{5}\sin x\right)$, where $-\frac{3\pi}{4}\leq x\leq\frac{\pi}{4}$

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226. Simplify: $\sin^{-1}\left(\frac{5}{13}\cos x+\frac{12}{13}\sin x\right)$

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227. Simplify: `sin^(-1)((sinx+cosx)/(sqrt(2))),\ -pi/4

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228. Simplify: `cos^(-1)((sinx+cosx)/(sqrt(2))),\ \ pi/4

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229. Simplify each of the following: `sin^(-1)((sinx+cosx)/(sqrt(2))),\ pi/4

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230. Evaluate the following: $\sin^{-1}(\sin 10)$ (ii) $\sin^{-1}(\sin 5)$

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231. Evaluate the following: $\cos^{-1}(\cos 10)$ (ii) $\tan^{-1}\{\tan(-6)\}$

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232. Evaluate each of the following:

(i) $\sin^{-1}\left(\frac{\sin\pi}{6}\right)$

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

(iii) $\sin^{-1}\left(\frac{\sin(5\pi)}{6}\right)$

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233. Evaluate each of the following:

(i) $\sin^{-1}\left(\sin\left(\frac{13\pi}{7}\right)\right)$

(ii) $\sin^{-1}\left(\sin\left(\frac{17\pi}{8}\right)\right)$

(iii) $\sin^{-1}\left\{\sin\left(-\frac{17\pi}{8}\right)\right\}$

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234. Evaluate each of the following:

$\sin^{-1}(\sin 3)$

(ii) $\sin^{-1}(\sin 4)$

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235. Evaluate each of the following:

(i)$\sin^{-1}(\sin 12)$

(ii) $\sin^{-1}(\sin 2)$

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236. Evaluate each of the following:

(i) $\cos^{-1}\left\{\cos\left(-\frac{\pi}{4}\right)\right\}$

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

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

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237. Evaluate each of the following:

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

(ii) $\cos^{-1}(\cos 3)$

(iii) $\cos^{-1}(\cos 4)$

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238. Evaluate each of the following:

(i)$\cos^{-1}(\cos 5)$

(ii) $\cos^{-1}(\cos 12)$

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239. Evaluate each of the following:

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

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

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

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240. Evaluate each of the following:

(i)$\tan^{-1}\left(\tan\left(\frac{9\pi}{4}\right)\right)$

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

(iii) $\tan^{-1}(\tan 2)$

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241. Evaluate each of the following:

(i)$\tan^{-1}(\tan 4)$

(ii) $\tan^{-1}(\tan 12)$

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242. Evaluate each of the following:

(i)$\sec^{-1}\left(\frac{\sec\pi}{3}\right)$

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

(iii) $\sec^{-1}\left(\frac{\sec(5\pi)}{4}\right)$

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243. Evaluate each of the following: $\sec^{-1}\left(\frac{\sec(7\pi)}{3}\right)$ (ii) $\sec^{-1}\left(\frac{\sec(9\pi)}{5}\right)$ (iii) $\sec^{-1}\left\{\sec\left(-\frac{7\pi}{3}\right)\right\}$

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244. Evaluate each of the following: $\sec^{-1}\left(\frac{\sec(13\pi)}{4}\right)$ (ii) $\sec^{-1}\left(\frac{\sec(25\pi)}{6}\right)$

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245. Evaluate each of the following: $\mathrm{cosec}^{-1}\left(\mathrm{cosec}\frac{\pi}{4}\right)$

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

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246. Evaluate each of the following:

(i) $\mathrm{cosec}^{-1}\left(\mathrm{cosec}\frac{6\pi}{5}\right)$

(ii) $\mathrm{cosec}^{-1}\left(\mathrm{cosec}\frac{11\pi}{6}\right)$

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247. Evaluate each of the following:

(i) $\mathrm{cosec}^{-1}\left(\mathrm{cosec}\frac{13\pi}{6}\right)$

(ii) $\mathrm{cosec}^{-1}\left\{\mathrm{cosec}\left(-\frac{9\pi}{4}\right)\right\}$

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248. Evaluate each of the following:

(i) $\cot^{-1}\left(\frac{\cot\pi}{3}\right)$

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

(iii) $\cot^{-1}\left(\frac{\cot(9\pi)}{4}\right)$

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249. Evaluate each of the following:

(i) $\cot^{-1}\left(\frac{\cot(19\pi)}{6}\right)$

(ii) $\cot^{-1}\left\{\cot\left(-\frac{8\pi}{3}\right)\right\}$

(iii) $\cot^{-1}\left\{\cot\left(\frac{21\pi}{4}\right)\right\}$

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250. Write each of the following in the simplest form:

$\cot^{-1}\left\{\frac{a}{\sqrt{x^2-a^2}}\right\}, \quad |x| > a$ (ii) $\tan^{-1}\left\{\sqrt{1+x^2}-x\right\}, \quad x \in R$

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251. Write each of the following in the simplest form:

(i) $\tan^{-1}\left\{\sqrt{1+x^2}-x\right\}, \quad x \in R$

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

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252. Write each of the following in the simplest form:

$\tan^{-1}\left\{\sqrt{\frac{a-x}{a+x}}\right\}$

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253. Write each of the following in the simplest form:

(i)`tan^(-1){x/(a+sqrt(a^2-x^2))},\ -a

(ii) `sin^(-1){(x+sqrt(1-x^2))/(sqrt(2))},\ -1/2

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254. Write each of the following in the simplest form:

(i) $\sin^{-1}\left\{\frac{\sqrt{1+x}+\sqrt{1-x}}{2}\right\}, \quad 0<x<1$

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

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255. Evaluate each of the following: $\sin\left(\frac{\sin^{-1}5}{13}\right)$ (ii) $\sin\left(\frac{\cos^{-1}4}{5}\right)$ (iii) $\sin\left(\frac{\tan^{-1}(15)}{8}\right)$

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256. Evaluate each of the following:

(i) $\sin\left(\cot^{-1}\left(\frac{4}{3}\right)\right)$

(ii) $\sin\left(\sec^{-1}\left(\frac{17}{15}\right)\right)$

(iii) $\sin\left(\mathrm{cosec}^{-1}\frac{17}{8}\right)$

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257. Evaluate each of the following: $\cos\left(\frac{\cos^{-1}5}{13}\right)$ (ii) $\cos\left(\frac{\sin^{-1}8}{17}\right)$ (iii) $\cos\left(\frac{\tan^{-1}3}{4}\right)$

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258. Evaluate each of the following: $\cos\left(\frac{\cot^{-1}(15)}{8}\right)$ (ii) $\cos\left(\frac{\sec^{-1}5}{3}\right)$ (iii) $\cos\left(\mathrm{cosec}^{-1}\frac{13}{12}\right)$

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259. Evaluate each of the following: $\tan\left(\frac{\tan^{-1}3}{4}\right)$ (ii) $\tan\left(\frac{\sin^{-1}5}{13}\right)$ (iii) $\tan\left(\frac{\cos^{-1}8}{17}\right)$

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260. Evaluate each of the following: $\tan\left(\mathrm{cosec}^{-1}\frac{13}{5}\right)$ (ii) $\tan\left(\frac{\sec^{-1}(13)}{12}\right)$ (iii) $\tan\left(\frac{\cot^{-1}8}{15}\right)$

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261. Evaluate: $\sin\left(\cot^{-1}\cos\left(\tan^{-1}x\right)\right.$

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

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263. Evaluate: $\sin\left(\cos^{-1}\left(\frac{3}{5}\right)+\cos ec^{-1}\frac{13}{5}\right)$

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264. Find the value of the expression $\sin\left[\cot^{-1}\left\{\cos\left(\tan^{-1}(1)\right)\right\}\right]$

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265. Prove that: $\sec^2\left(\tan^{-1}2\right)+\cos ec^2\left(\cot^{-1}3\right)=15$ and $\tan^2\left(\sec^{-1}2\right)+\cot^2\left(\cos ec^{-1}3\right)=11$

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266. Prove that: $\sec^2\left(\tan^{-1}2\right)+\cos ec^2\left(\cot^{-1}3\right)=15$ and $\tan^2\left(\sec^{-1}2\right)+\cot^2\left(\cos ec^{-1}3\right)=11$

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

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

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

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

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

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270. Solve the following equation for x: $\cos\left(\tan^{-1}x\right)=\sin\left(\frac{\cot^{-1}3}{4}\right)$, $\tan\left(\cos^{-1}x\right)=\sin\left(\frac{\cot^{-1}1}{2}\right)$

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271. Solve the following equation for x: $\cos\left(\tan^{-1}x\right)=\sin\left(\frac{\cot^{-1}3}{4}\right)$, $\tan\left(\cos^{-1}x\right)=\sin\left(\frac{\cot^{-1}1}{2}\right)$

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272. If $x=\cos ec\left[\tan^{-1}\left\{\cos\left(\cot^{-1}\left(\sec\left(\sin^{-1}a\right)\right)\right)\right\}\right]$ and $y=\sec\left[\cot^{-1}\left\{\sin\left(\tan^{-1}\left(\cos ec\left(\cos^{-1}a\right)\right)\right)\right\}\right]$

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273. If $\sin^{-1}x+\sin^{-1}y+\sin^{-1}z=\pi$, prove that: $x\sqrt{1-x^2}+y\sqrt{1-y^2}+z\sqrt{1-z^2}=2xyz$

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274. If $\sin^{-1}x+\sin^{-1}y+\sin^{-1}z=\pi$, show that $x^4+y^4+z^4+4x^2y^2z^2=2\left(x^2y^2+y^2z^2+z^2x^2\right)$

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275. If $\tan^{-1}\left\{\frac{\sqrt{1+x^2}-\sqrt{1-x^2}}{\sqrt{1+x^2}+\sqrt{1-x^2}}\right\}=\alpha$, then prove that $x^2=\sin 2\alpha$

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276. Prove that:

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

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277. Evaluate each of the following: $\sin\left(\sin^{-1}\left(\frac{7}{25}\right)\right)$ (ii) $\sin\left(\cos^{-1}\left(\frac{5}{13}\right)\right)$ (iii) $\sin\left(\tan^{-1}\left(\frac{24}{7}\right)\right)$

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278. Evaluate each of the following: $\sin\left(\frac{\sec^{-1}(17)}{8}\right)$ (ii) $\mathrm{cosec}\left(\frac{\cos^{-1}3}{5}\right)$ (iii) $\sec\left(\frac{\sin^{-1}(12)}{13}\right)$

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279. Evaluate each of the following:

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

(ii) $\cot\left(\cos^{-1}\left(\frac{3}{5}\right)\right)$

(iii) $\cos\left(\tan^{-1}\left(\frac{24}{7}\right)\right)$

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280. Prove the following results: $\tan\left(\frac{\cos^{-1}4}{5}+\frac{\tan^{-1}2}{3}\right)=\frac{17}{6}$ (ii) $\cos\left(\frac{\sin^{-1}3}{5}+\frac{\cot^{-1}3}{2}\right)=\frac{6}{5\sqrt{13}}$

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281. Prove the following results: $\tan\left(\frac{\sin^{-1}(15)}{13}+\frac{\cos^{-1}3}{5}\right)=\frac{63}{16}$ (ii) $\sin\left(\frac{\cos^{-1}3}{5}+\frac{\sin^{-1}5}{13}\right)=\frac{63}{65}$

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282. Solve: $\cos\left(\sin^{-1}x\right)=\frac{1}{6}$

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283. Solve: $\cos\left\{2\sin^{-1}(-x)\right\}=0$

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284. Evaluate: $\cos\left\{\sin^{-1}\left(-\frac{5}{13}\right)\right\}$ (ii) $\cot\left\{\sin^{-1}\left(-\frac{7}{25}\right)\right\}$

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285. Evaluate: $\sec\left\{\sin^{-1}\left(-\frac{8}{17}\right)\right\}$

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286. Evaluate: $\sin\left\{\cos^{-1}\left(-\frac{3}{5}\right)\right\}$ (ii) $\tan\left\{\cos^{-1}\left(-\frac{12}{13}\right)\right\}$

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287. Evaluate: $\mathrm{cosec}\left\{\cos^{-1}\left(-\frac{12}{13}\right)\right\}$

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288. Evaluate: $\sin\left\{\tan^{-1}\left(-\frac{7}{24}\right)\right\}$ (ii) $\cos\left\{\cot^{-1}\left(-\frac{5}{12}\right)\right\}$

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289. Evaluate: $\mathrm{cosec}\left\{\cot^{-1}\left(-\frac{4}{3}\right)\right\}$

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290. Prove that: $\sin^{-1}\left(-\frac{4}{5}\right)=\tan^{-1}\left(-\frac{4}{3}\right)=co^{-1}\left(-\frac{3}{5}\right)-\pi$

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291. Prove that:

$$\tan^{-1}x+\frac{\tan^{-1}1}{x}=\begin{cases}\frac{\pi}{2}, & \text{if } x>0\\ -\frac{\pi}{2}, & \text{if } x<0\end{cases}$$

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292. Evaluate: $\cos\left\{\sin^{-1}\left(-\frac{7}{25}\right)\right\}$ (ii) $\sec\left\{\cot^{-1}\left(-\frac{5}{12}\right)\right\}$ (iii) $\cot\left\{\sec^{-1}\left(-\frac{13}{5}\right)\right\}$

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293. Evaluate: $\cot\left\{\sec^{-1}\left(-\frac{13}{5}\right)\right\}$

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294. Evaluate: (i) $\tan\left\{\cos^{-1}\left(-\frac{7}{25}\right)\right\}$

(ii) $\mathrm{cosec}\left\{\cot^{-1}\left(-\frac{12}{5}\right)\right\}$

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

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295. Evaluate: $\sin\left\{\sin^{-1}\left(-\frac{3}{5}\right)+\cot^{-1}\left(-\frac{5}{12}\right)\right\}$

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296. Find the value of $\cot\left(\tan^{-1}a+\cot^{-1}a\right)$

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297. If $-1\leq x$, $y\leq 1$ such that $\sin^{-1}x+\sin^{-1}y=\frac{\pi}{2}$, find the value of $\cos^{-1}x+\cos^{-1}y$.

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

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299. If $\tan^{-1}x-\cot^{-1}x=\tan^{-1}\left(\frac{1}{\sqrt{3}}\right)$ find the value of x.

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300. If $\sin\left(\cos^{-1}\left(\frac{5}{13}\right)+\sin^{-1}x\right)=1$ find the value of x.

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

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302. If $\cos\left(\sin^{-1}\left(\frac{2}{5}\right)+\cos^{-1}x\right)=0$ find the value of x.

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303. Evaluate : $\cos\left(2\cos^{-1}x+\sin^{-1}x\right)atx=\frac{1}{5}$

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304. If $\left(\tan^{-1}x\right)^2+\left(\cot^{-1}x\right)^2=\frac{5\pi^2}{8}$ then x equals

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

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

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307. Find the maximum and minimum values of $\left(\sin^{-1} x\right)^3 + \left(\cos^{-1} x\right)^3$, where $-1 \leq x \leq 1$.

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308. Evaluate: (i) $\cot\left(\sin^{-1}\left(\frac{3}{4}\right) + \sec^{-1}\left(\frac{4}{3}\right)\right)$ (ii) $\sin\left(\tan^{-1} x + \tan^{-1}\left(\frac{1}{x}\right)\right)$ for $x < 0$

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309. Evaluate: (i) $\sin\left(\tan^{-1}x+\tan^{-1}\left(\frac{1}{x}\right)\right)$ for $x>0$

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

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310. Evaluate: $\cos\left(\sec^{-1}x+\mathrm{cosec}^{-1}x\right),|x|\geq 1$

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311. If $-1\leq x,y\leq 1$ such that $\sin^{-1}x+\sin^{-1}y=\frac{\pi}{2}$, find the value of $\cos^{-1}x+\cos^{-1}y$.

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312. If $\sin^{-1}x + \sin^{-1}y = \frac{\pi}{3}$ and $\cos^{-1}x - \cos^{-1}y = \frac{\pi}{6}$, find the values of x and y.

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313. If $\cot\left(\cos^{-1}\left(\frac{3}{5}\right) + \sin^{-1}x\right) = 0$, find the values of x.

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314. If $\left(\sin^{-1}x\right)^2 + \left(\cos^{-1}x\right)^2 = \frac{17\pi^2}{36}$, find x.

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315. If $\sin\left(\sin^{-1}\left(\frac{1}{5}\right) + \cos^{-1}(x)\right) = 1$ Find the value of x.

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316. Solve: $\sin^{-1} x = \frac{\pi}{6} + \cos^{-1} x$

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317. Solve : $4\sin^{-1} x = \pi - \cos^{-1} x$

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318. Solve: $\tan^{-1} x + 2\cot^{-1} x = \frac{2\pi}{3}$

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319. Solve: $5\tan^{-1} x + 3\cot^{-1} x = 2\pi$

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

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321. Prove that : $\tan^{-1} 2 + \tan^{-1} 3 = \frac{3\pi}{4}$

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

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323. Prove 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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324. If $\tan^{-1} 2 + \tan^{-1} 3 + \theta = \pi$ find the value of θ.

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325. 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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326. 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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327. $\tan^{-1}\left(\frac{3}{4}\right)+\tan^{-1}\left(\frac{3}{5}\right)+\tan^{-1}\left(\frac{8}{19}\right)$

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

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330. Prove that: $\frac{\tan^{-1}(1-x)}{1+x} - \frac{\tan^{-1}(1-y)}{1+y} = \frac{\sin^{-1}(y-x)}{\sqrt{1+x^2 1+y^2}}$

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331. If $a > b > c > 0$, prove that $\cot^{-1}\left(\frac{ab+1}{a-b}\right) + \cot^{-1}\left(\frac{bc+1}{b-c}\right) + \cot^{-1}\left(\frac{ca+1}{c-a}\right) = \pi$

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

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

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334. Solve: $\tan^{-1}\left(\frac{x-1}{x+1}\right) + \tan^{-1}\left(\frac{2x-1}{2x+1}\right) = \tan^{-1}\left(\frac{23}{36}\right)$

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335. If $a,\ b,\ c > 0$ such that $a + b + c = abc$, find the value of $\tan^{-1} a + \tan^{-1} b + \tan^{-1} c$.

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336. Solve the equation: $\tan^{-1}\sqrt{x^2 + x} + \sin^{-1}\sqrt{x^2 + x + 1} = \frac{\pi}{2}$

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337. If $a_1, a_2, a_3, , a_n$ are in arithmetic progression with common difference d, then evaluate the following expression:

$$\tan\left\{\tan^{-1}\left(\frac{d}{1+a_1a_2}\right)+\tan^{-1}\left(\frac{d}{1+a_2a_3}\right)+\tan^{-1}\left(\frac{d}{1+a_3a_4}\right)+ +\right.$$

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338. Prove that :

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

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339. Sum the following series to infinity :

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

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340. If $c_i > 0$ for $i = 1, 2, , n$, prove that $\tan^{-1}\left(\frac{c_1 x - y}{c_1 y + x}\right) + \tan^{-1}\left(\frac{c_2 - c_1}{1 + c_2 c_1}\right) + \tan^{-1}\left(\frac{c_3 - c_2}{1 + c_3 c_2}\right) + \dot{+} \tan^{-1}$

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341. 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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342. If $a, b, c > 0$ and $s = \frac{a + b + c}{2}$, *provethat* $\tan^{-1}\sqrt{\frac{2as}{bc}} + \tan^{-1}\sqrt{\frac{2bs}{ca}} + \tan^{-1}\sqrt{\frac{2cs}{ab}} = \pi$

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343. Simplify $\left[\frac{3\sin 2\alpha}{5 + 3\cos 2\alpha}\right] + \tan^{-1}\left[\frac{\tan\alpha}{4}\right]$, *where* $-\frac{\pi}{2} < \alpha < \frac{\pi}{2}$

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344. Prove that:

$$\tan^{-1}\left(\frac{1}{2}\tan 2A\right)+\tan^{-1}(\cot a)+\tan^{-1}\left(\cot^3 A\right)=\begin{cases}0, & \text{if } \frac{\pi}{4}<a<\end{cases}$$

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

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347. Prove: $\tan^{-1}\left(\frac{1}{4}\right)+\tan^{-1}\left(\frac{2}{9}\right)=\sin^{-1}\left(\frac{1}{\sqrt{5}}\right)$

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

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

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350. Solve for x: $\tan^{-1}(x+1) + \tan^{-1}(x-1) = \tan^{-1}\left(\frac{8}{31}\right)$

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351. Solve : $\tan^{-1}(x-1) + \tan^{-1} x + \tan^{-1}(x+1) = \tan^{-1} 3x$

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

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353. Solve for x : $\cot^{-1}x - \cot^{-1}(x+2) = \frac{\pi}{12}$, where $x > 0$

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354. Solve for x : $\tan^{-1}(x+2) + \tan^{-1}(x-2) = \tan^{-1}\left(\frac{8}{79}\right), x > 0$

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355. Solve for x : $\tan^{-1}\left(\frac{x}{2}\right) + \tan^{-1}\left(\frac{x}{3}\right) = \frac{\pi}{4}$, `0

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

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357. Solve for x: $\tan^{-1}(2+x)+\tan^{-1}(2-x)=\frac{\tan^{-1}2}{3}$, where $x<-\sqrt{3}$ or, $x>\sqrt{3}$

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

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359. Find the sum of the series :

$$\left(\tan^{-1}\right)\frac{1}{3}+\left(\tan^{-1}\right)\frac{2}{9}+\ldots.+\left(\tan^{-1}\right)\frac{2^{n-1}}{1+2^{2n-1}}+\ldots\ldots\infty$$

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360. Prove that :

$$\sin^{-1}\left(\frac{8}{17}\right)+\sin^{-1}\left(\frac{3}{5}\right)=\sin^{-1}\left(\frac{77}{85}\right)=\tan^{-1}\left(\frac{77}{36}\right)$$

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361. 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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362. Prove each of the following

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

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363. Prove 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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364. Prove that $\sin^{-1}\left(\frac{8}{17}\right)+\sin^{-1}\left(\frac{3}{5}\right)=\cos^{-1}\left(\frac{36}{85}\right)$

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365. Show that $\sin^{-1}\left(\frac{3}{5}\right)+\cos^{-1}\left(\frac{12}{13}\right)=\cos^{-1}\left(\frac{33}{65}\right)=\sin^{-1}\left(\frac{56}{65}\right)$

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366. $\sin^{-1}\left(\frac{3x}{5}\right)+\sin^{-1}\left(\frac{4x}{5}\right)=\sin^{-1}x$, then roots of the equation are- a.0 b. 1 c.-1 d. -2

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367. Solve the equation $\sin^{-1}6x+\sin^{-1}6\sqrt{3}x=\frac{-\pi}{2}$.

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368. Evaluate: $\cos\left(\sin^{-1}\left(\frac{3}{5}\right)+\sin^{-1}\left(\frac{5}{13}\right)\right)$

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

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371. 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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372. solve : $\sin^{-1} x + \sin^{-1} 2x = \frac{\pi}{3}$

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

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374. Show 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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375. If $\frac{\cos^{-1} x}{a} + \frac{\cos^{-1} y}{b} = \alpha$, prove that $\frac{x^2}{a^2} - 2\frac{xy}{ab}\cos\alpha + \frac{y^2}{b^2} = \sin^2\alpha$

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

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377. If $\cos^{-1}\left(\frac{x}{2}\right) + \cos^{-1}\left(\frac{y}{3}\right) = \alpha$ then prove that $9x^2 - 12xy\cos\alpha + 4y^2 = 36\sin^2\alpha$.

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378. Solve the equation: $\cos^{-1}\left(\frac{a}{x}\right) - \cos^{-1}\left(\frac{b}{x}\right) = \cos^{-1}\left(\frac{1}{a}\right)$

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379. $\cos^{-1} x\sqrt{3} + \cos^{-1} x = \frac{\pi}{2}$

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380. 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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381. Evaluate: $\sin\left(2\sin^{-1}0.6\right)$

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382. Evaluate: $\sin\left(3\sin^{-1}0.4\right)$

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383. Prove the following:

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

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384. 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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385. Evaluate: $\tan\left(2\tan^{-1}\left(\frac{1}{5}\right)\right)$

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

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387. Prove that : $\tan\left(\frac{1}{2}\right)\left\{\sin^{-1}\left(\frac{2x}{1+x^2}\right)+\cos^{-1}\left(\frac{1-y^2}{1+y^2}\right)\right\}=\frac{x+y}{1-xy}$, if $|x|<1,\ y>0$ and $xy<1$.

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

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

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

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

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393. Differentiate `tan^(-1)((3a^2x-x^3)/(a^3-3a x^2)),\ -1/(sqrt(3))

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394. $4\tan^{-1}\left(\frac{1}{5}\right)=\tan^{-1}\left(\frac{1}{70}\right)+\tan^{-1}\left(\frac{1}{99}\right)+\frac{\pi}{4}$

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

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396. Evaluate: $\tan\left\{2tan^{-1}\left(\frac{1}{5}\right)-\frac{\pi}{4}\right\}$

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

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

Watch Video Solution

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

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400. Solve the following equation: $\sin^{-1}x+\sin^{-1}(1-x)=\cos^{-1}x$

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401. Solve for x :

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

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402. If $\frac{\cos^{-1}(x^2-1)}{x^2+1}+\frac{\tan^{-1}(2x)}{x^2-1}=\frac{2\pi}{3}$, then x equal to (A) $\sqrt{3}$ (B) $2+\sqrt{3}$ (C) $2-\sqrt{3}$ (D) $-\sqrt{3}$

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403. If $y=\cot^{-1}\left(\sqrt{\cos x}\right)-\tan^{-1}\left(\sqrt{\cos x}\right)$, prove that $\sin y=\tan^2\left(\frac{x}{2}\right)$

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404. Prove that :

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

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405. Show taht

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

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406. Prove that:

$$\frac{\alpha^3}{2}\cos ec^2\left(\frac{1}{2}\tan^{-1}\left(\frac{\alpha}{\beta}\right)\right)+\frac{\beta^3}{2}sec^2\left(\frac{1}{2}\tan^{-1}\left(\frac{\beta}{\alpha}\right)\right)=(\alpha+\beta)(\alpha^2+\beta$$

.

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407. Prove that :

$$\tan^{-1}\left\{\frac{\cos 2\alpha \sec 2\beta + \cos 2\beta \sec 2\alpha}{2}\right\} = \tan^{-1}\{tan^2(\alpha+\beta)tan^2(\alpha-\beta$$

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408. Evaluate the following: (i) $\tan\left\{2\tan^{-1}\left(\frac{1}{5}\right) - \frac{\pi}{4}\right\}$ (ii) $\tan\left(\frac{1}{2}\sin^{-1}\left(\frac{3}{4}\right)\right)$

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

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410. Prove the following:

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

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411. Prove: $\tan^{-1}\left(\frac{2}{3}\right) = \frac{1}{2}\tan^{-1}\left(\frac{12}{5}\right)$

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412. Prove the following: $\tan^{-1}\left(\frac{1}{7}\right) + 2\tan^{-1}\left(\frac{1}{3}\right) = \frac{\pi}{4}$

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413. Prove the following : $\sin^{-1}\left(\frac{4}{5}\right) + 2\tan^{-1}\left(\frac{1}{3}\right) = \frac{\pi}{2}$

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

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415. Prove the following: $2\tan^{-1}\left(\frac{3}{4}\right) - \tan^{-1}\left(\frac{17}{31}\right) = \tan^{-1}\left(\frac{\pi}{4}\right)$

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416. 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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417. Prove that: $\tan^{-1}\left(\frac{1-x^2}{2x}\right) + \cot^{-1}\left(\frac{1-x^2}{2x}\right)\frac{\pi}{2}$

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

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419. If $\sin^{-1}\left(\frac{2a}{1+a^2}\right) + \sin^{-1}\left(\frac{2b}{1+b^2}\right) = 2\tan^{-1}x$ then $x =$

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420. Show that $:2\tan^{-1}x+\sin^{-1}\left(\frac{2x}{1+x^2}\right)$ is constant for $x \geq 1,$ find that constant.

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

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

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423. Find the value of $\tan^{-1}\left(\frac{x-2}{x-1}\right)+\tan^{-1}\left(\frac{x+2}{x+1}\right)=\frac{\pi}{4}$

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424. Solve the following equation for x:

$$\tan^{-1}\left(\frac{1}{4}\right)+2\tan^{-1}\left(\frac{1}{5}\right)+\tan^{-1}\left(\frac{1}{6}\right)+\tan^{-1}\left(\frac{1}{x}\right)=\frac{\pi}{4}$$

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425. Solve

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

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426. Solve the following equation for x:

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

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

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428. Solve for x: $\cos^{-1}\left(\frac{x^2-1}{x^2+1}\right)+\frac{1}{2}\tan^{-1}\left(\frac{2x}{1-x^2}\right)=\frac{2\pi}{3}$

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429. 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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430. Show that $\left(\tan^{-1}\right)\frac{2ab}{a^2-b^2}+\left(\tan^{-1}\right)\frac{2xy}{x^2-y^2}=\left(\tan^{-1}\right)\frac{2\alpha\beta}{\alpha^2-\beta^2}$, where $\alpha=ax-by$ and $\beta=ay+bx$.

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431. For any $a, b, x, y > 0$, prove that :

$$\frac{2}{3}\tan^{-1}\left(\frac{3ab^2 - a^3}{b^3 - 3a^2b}\right) + \frac{2}{3}\tan^{-1}\left(\frac{3xy^2 - x^3}{y^3 - 3x^2y}\right) = \frac{\tan^{-1}(2\alpha\beta)}{\alpha^2 - \beta^2},$$

where $\alpha = -ax + by\ \beta = bx + ay$.

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

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433. Write the difference between maximum and minimum values of $\sin^{-1} x$ for $x \in [-1, 1]$.

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434. If $\sin^{-1} x + \sin^{-1} y + \sin^{-1} z = \frac{3\pi}{2}$, then write the value of $x + y + z$.

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435. If $x > 1$, then write the value of $\sin^{-1}\left(\frac{2x}{1+x^2}\right)$ in terms of $\tan^{-1} x$

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436. If $x < 0$, then write the value of $\cos^{-1}\left(\frac{1-x^2}{1+x^2}\right)$ in terms of $\tan^{-1} x$

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437. Write the value of $\tan^{-1} x + \tan^{-1}\left(\frac{1}{x}\right)$ for $x > 0$

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438. Write the value of $\tan^{-1} x + \tan^{-1}\left(\frac{1}{x}\right)$ for $x < 0$

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

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440. Write the value of $\sin\left(\cot^{-1} x\right)$.

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

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442. The range of $\tan^{-1} x$ is

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443. Write the value of $\cos^{-1}(\cos 1540^\circ)$.

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444. Evaluate each of the following: $\sin^{-1}(\sin(-600o))$ (ii) $\cos^{-1}(\cos(-680o))$

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

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446. Write the value of $\sin^{-1}(\sin 1550^\circ)$

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

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448. Evaluate: $\sin\left(\frac{\tan^{-1}3}{4}\right)$

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

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

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451. Write the value of $\cos^{-1}(\cos 350) - \sin^{-1}(\sin 350)$

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

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

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454. Write the value of $\cos^{-1}(\cos 6)$.

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455. Write the value of $\sin^{-1}\left(\frac{\cos\pi}{9}\right)$.

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

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457. Write the value of $\tan^{-1}\left\{\tan\left(\frac{15\pi}{4}\right)\right\}$

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

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459. Write the value of $\frac{\tan^{-1}a}{b}-\tan^{-1}\left(\frac{a-b}{a+b}\right)$

Watch Video Solution

460. Write the value of $\cos^{-1}\left(\frac{\cos(5\pi)}{4}\right)$.

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461. Show that $\sin^{-1}\left(2x\sqrt{1-x^2}\right) = 2\sin^{-1}x$

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462. The value of $\sin^{-1}\left(\sin'\frac{3\pi}{5}\right)$ is â€¦.

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463. If $\tan^{-1}\left(\sqrt{3}\right) + \cot^{-1}x = \frac{\pi}{2}$, find x.

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

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465. Write the value of $\sin^{-1}\left(\frac{1}{3}\right) - \cos^{-1}\left(-\frac{1}{3}\right)$.

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466. If $4\sin^{-1}x + \cos^{-1}x = \pi$, then what is the value of x ?

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467. If $x < 0,\ y < 0$ such that $xy = 1$, then write the value of $\tan^{-1}x + \tan^{-1}y$.

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468. What is the principal value of $\sin^{-1}\left(-\frac{\sqrt{3}}{2}\right)$?

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

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470. Write the principal value of $\cos^{-1}\left(\frac{\cos(2\pi)}{3}\right)+\sin^{-1}\left(s\in\frac{2\pi}{3}\right)$

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471. Write the value of $\tan\left(2\frac{\tan^{-1}1}{5}\right)$.

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

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

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

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475. Write the principal value of $\cos^{-1}\left[\cos\left(680^0\right)\right]$.

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

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

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478. Write the value of $\cos\left(\sin^{-1} x + \cos^{-1} x\right)$, $|x| \leq 1$.

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

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

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481. Find the set of values of $\mathrm{cosec}^{-1}\left(\frac{\sqrt{3}}{2}\right)$

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482. Write the value of $\tan^{-1}\left(\frac{1}{x}\right)$ for $x < 0$ in terms of $\cot^{-1}(x)$.

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483. The value of $\cot^{-1}(-x) x \in R$ in terms of $\cot^{-1} x$ is â€¦â€¦..

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484. Write the value of $\cos\left(\frac{\tan^{-1} x + \cot^{-1} x}{3}\right)$, when $x = -\frac{1}{\sqrt{3}}$.

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485. If $\cos\left(\tan^{-1} x + \cot^{-1}\sqrt{3}\right) = 0$, find the value of x.

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

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487. If $\cos\left(\frac{\sin^{-1} 2}{5} + \cos^{-1} x\right) = 0$ find the value of x.

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488. Find the value of the following: $\cos^{-1}\left(\frac{\cos(13\pi)}{6}\right)$

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489. 8. Find the principal value of $\tan^{-1}\left(\frac{\tan(9\pi)}{8}\right)$

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490. If $\tan^{-1}\left\{\frac{\sqrt{1+x^2}-\sqrt{1-x^2}}{\sqrt{1+x^2}+\sqrt{1-x^2}}\right\}=\alpha$, then $x^2=\sin 2\alpha$ (b) $\sin\alpha$ (c) $\cos 2\alpha$ (d) $\cos\alpha$

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491. The value of $\tan\left\{\frac{\cos^{-1}1}{5\sqrt{2}}-\frac{\sin^{-1}4}{\sqrt{17}}\right\}$ is $\frac{\sqrt{29}}{3}$ (b) $\frac{29}{3}$ (c) $\frac{\sqrt{3}}{29}$ (d) $\frac{3}{29}$

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492. The value of $2\tan^{-1}\left(\cos ec\tan^{-1}x-\tan\cot^{-1}x\right)$ is equal to $\cot^{-1}x$ (b) $\frac{\cot^{-1}1}{x}$ $\tan^{-1}x$ (d) none of these

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493. If $\frac{\cos^{-1} x}{a} + \frac{\cos^{-1} y}{b} = \alpha$, prove that $\frac{x^2}{a^2} - 2\frac{xy}{ab}\cos\alpha + \frac{y^2}{b^2} = \sin^2\alpha$

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494. Find the number of positive integral solution of the equation $\tan^{-1} x + \frac{\cos^{-1} y}{\sqrt{1-y^2}} = \frac{\sin^{-1} 3}{\sqrt{10}}$

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495. If $\sin^{-1} x - \cos^{-1} x = \frac{\pi}{6}$, then $x =$ $\frac{1}{2}$ (b) $\frac{\sqrt{3}}{2}$ (c) $-\frac{1}{2}$ (d) none of these

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496. $\sin\left[\cot^{-1}\left\{\tan\left(\cos^{-1}x\right)\right\}\right]$ is e uq (a) x (b) $\sqrt{1-x^2}$ (c) $\frac{1}{x}$ (d) None of these

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497. The number of solutions of equation $\tan^{-1}2x+\tan^{-1}3x=\frac{\pi}{4}$ is (a) 2 (b) 3 (c) 1 (d) none of these

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498. If $\alpha=\tan^{-1}\left(tan\frac{5\pi}{4}\right)and\beta=\tan^{-1}\left(-\frac{\tan(2\pi)}{3}\right),then$ $4\alpha=3\beta$ (b) $3\alpha=4\beta$ (c) $\alpha-\beta=74\alpha=\frac{3\beta}{12}$ none of these

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499. The number of real solutions of the equation $\sqrt{1+\cos 2x}=\sqrt{2}\sin^{-1}(\sin x),\ -\pi\leq x\leq\pi$ is 0 (b) 1 (c) 2 (d) infinite

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500. If $x < 0,\ y < 0$ such that $xy = 1$, then $\tan^{-1} x + \tan^{-1} y$ equals $\frac{\pi}{2}$ (b) $-\frac{\pi}{2}$ (c) π (d) none of these

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501. If $u = \cot^{-1}\sqrt{\tan\alpha} - \tan^{-1}\sqrt{\tan\alpha},$ then $\tan\left(\frac{\pi}{4} - \frac{u}{2}\right)$ is equal to (a) $\sqrt{\tan\alpha}$ (b) $\sqrt{\cos\alpha}$ (c) $\tan\alpha$ (d) $\cot\alpha$

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502. If $\cos^{-1}\left(\frac{x}{3}\right) + \cos^{-1}\left(\frac{y}{2}\right) = \frac{\theta}{2}$, then $4x^2 - 12xy\cos\left(\frac{\theta}{2}\right) + 9y^2 =$ (a) 36 (b) $36 - 36\cos\theta$ (c) $18 - 18\cos\theta$ (d) $18 + 18\cos\theta$

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503. If $\alpha = \tan^{-1}\left(\frac{\sqrt{3}x}{2y - x}\right)$, $\beta = \tan^{-1}\left(\frac{2x - y}{\sqrt{3}y}\right)$, then $\alpha - \beta =$

$\frac{\pi}{6}$ (b) $\frac{\pi}{3}$ (c) $\frac{\pi}{2}$ (d) $-\frac{\pi}{3}$

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504. Let $f(x) = e^{\cos^{-1}\left\{\sin\left(x + \frac{\pi}{3}\right)\right\}}$. Then, $f\left(\frac{8\pi}{9}\right) = e^{5\pi/18}$ (b) $e^{13\pi/18}$

(c) $e^{-2\pi/18}$ (d) none of these

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505. $\frac{\tan^{-1}1}{11} + \frac{\tan^{-1}2}{11}$ is equal to (a) 0 (b) $1/2$ (c) -1 (d) none of these

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506. If $\cos^{-1}\left(\frac{x}{2}\right) + \cos^{-1}\left(\frac{y}{3}\right) = \theta$, then $9x^2 - 12xy\cos\theta + 4y^2$ is

equal to (a) 36 (b) $-36\ s \in {}^2\theta$ (c) $36\sin{}^2\theta$ (d) $36\cos{}^2\theta$

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507. If $\tan^{-1}3+\tan^{-1}x=\tan^{-1}8$, then $x=$ (a) 5 (b) $1/5$ (c) $5/14$ (d) $14/5$

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508. The value of $\sin^{-1}\left(\frac{\cos(33\pi)}{5}\right)$ is $\frac{3\pi}{5}$ (b) $-\frac{\pi}{10}$ (c) $\frac{\pi}{10}$ (d) $\frac{7\pi}{5}$

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

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510. $\sin\left\{2\cos^{-1}\left(-\frac{3}{5}\right)\right\}$ is equal to $6/25$ (b) $24/25$ (c) $4/5$ (d) $-24/25$

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511. If $\theta = \sin^{-1}\{\sin(-600^\circ)\}$, then one of the possible values of θ is

$\frac{\pi}{3}$ (b) $\frac{\pi}{2}$ (c) $\frac{2\pi}{3}$ (d) $\frac{-2\pi}{3}$

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512. If

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

then x is equal to $\frac{1}{\sqrt{3}}$ (b) $-\frac{1}{\sqrt{3}}$ (c) $\sqrt{3}$ (d) $-\frac{\sqrt{3}}{4}$

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513. If $4\cos^{-1}x + \sin^{-1}x = \pi$, then the value of x is

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

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

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

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

Answer: C

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514. If $\tan^{-1}\left(\frac{x+1}{x-1}\right)+\tan^{-1}\left(\frac{x-1}{x}\right)=\tan^{-1}(-7)$, then the value of x is (a) 0 (b) -2 (c) 1 (d) 2

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515. If $\cos^{-1}x>\sin^{-1}x$, then `1/(sqrt(2))0`

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516. The value of $\sin\left(\frac{1}{4}\frac{\sin^{-1}\left(\sqrt{63}\right)}{8}\right)$ is $\frac{1}{\sqrt{2}}$ (b) $\frac{1}{\sqrt{3}}$ (c) $\frac{1}{2\sqrt{2}}$ (d) $\frac{1}{3\sqrt{3}}$

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

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518. If $\tan^{-1}(\cot\theta) = 2\theta$, then $\theta = \pm\frac{\pi}{3}$ (b) $\pm\frac{\pi}{4}$ (c) $\pm\frac{\pi}{6}$ (d) none of these

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519. If $\sin^{-1}\left(\frac{2a}{1+a^2}\right) + \cos^{-1}\left(\frac{1-b^2}{1+b^2}\right) = \tan^{-1}\left(\frac{2x}{1-x^2}\right)$, where $a, x \in]0, 1[$, then the value of x is

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520. The value of $\sin\left(2\left(\tan^{-1}0.75\right)\right)$ is equal to (a) 0.75 (b) 1.5 (c) 0.96 (d) $\sin^{-1}1.5$

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521. If $x > 1$, then $2\tan^{-1}x + \sin^{-1}\left(\frac{2x}{1+x^2}\right)$ is equal to $4\tan^{-1}x$ (b) 0 (c) $\frac{\pi}{2}$ (d) π

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522. The domain of $\cos^{-1}\left(x^2-4\right)is$ [3,5] (b) $[-1,1]$ $\left[-\sqrt{5},-\sqrt{3}\right]\cup\left[\sqrt{3},\sqrt{5}\right]-\sqrt{5},-\sqrt{3}]\cap[-\sqrt{5},\sqrt{3}]$

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523. The value of $\tan\left(\frac{\cos^{-1}3}{5}+\frac{\tan^{-1}1}{4}\right)$ is $\frac{19}{8}$ (b) $\frac{8}{19}$ (c) $\frac{19}{12}$ (d) $\frac{3}{4}$

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Others

1. Write the value of $\sec^{-1}\left(\frac{1}{2}\right)$.

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2. If $\cos^{-1} x > \sin^{-1} x$, then `1/(sqrt(2))0`

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