



## MATHS

### BOOKS - OBJECTIVE RD SHARMA MATHS VOL I (HINGLISH)

#### INVERSE TRIGONOMETRIC FUNCTIONS

##### Illustration

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

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

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

C.  $\frac{4\pi}{3}$

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

**Answer: B**



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2. The principal value of  $\sin^{-1}\left\{\tan\left(\frac{-5\pi}{4}\right)\right\}$  is

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

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

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

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

Answer: D



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

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

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

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

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

**Answer: B**



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

A.  $[-1, 1]$

B.  $[-5, -1]$

C.  $[1, 2]$

D.  $[-2, 2]$

**Answer: C**



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5. The domain of definition of  $f(x) = \sin^{-1}(-x^2)$  is

A.  $[-1, 1]$

B.  $[0, 1]$

C.  $[-1, 0]$

D.  $[-2, 2]$

**Answer: A**



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6. The domain of definition of  $f(x) = \sin^{-1}\sqrt{x-1}$

A.  $[-1, 1]$

B.  $[0, 1]$

C.  $[1, 2]$

D.  $[2, 3]$

**Answer: C**



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7. 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  $x^2 + y^2 + z^2$

A. 1

B. 3

C.  $\frac{3\pi^2}{4}$

D.  $3\pi^2$

**Answer: B**



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8.

If

$\sin^{-1} x + \sin^{-1} y + \sin^{-1} z = \frac{3\pi}{2}$  and  $f(1) = 2$ .  $f(p + q) = f(p) \cdot f(q) \forall 1$

then  $x^{f(1)} + y^{f(2)} + z^{f(3)} - \frac{x + y + z}{x^{f(1)} + y^{f(2)} + z^{f(3)}}$  is equal to

A. 0

B. 1

C. 2

D. 3

**Answer:**



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9. The domain of definition of  $\cos^{-1}(2x - 1)$  is

A.  $[-1, 1]$

B.  $[0, 1]$

C.  $[-1, 0]$

D.  $[0, 2]$

**Answer: B**



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

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

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

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

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

Answer: C



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

A.  $-3$

B.  $3$

C. 0

D.  $3\pi$

**Answer: B**



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12. 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  $xy + yz + zy$

A. 0

B. 1

C. 3

D.  $-3$

**Answer: C**



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

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

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

C.  $\frac{3\pi}{4}$

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

**Answer: B**



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

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

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

C.  $\frac{3\pi}{4}$

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

**Answer: A**

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

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

A. 2

B. 4

C. 6

D. 1

**Answer:**

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

A.  $\mathbb{R}$

B.  $[-1, 1]$

C.  $(-\infty, -1] \cup [0, \infty)$

D.  $[-\infty, -1] \cup [1, \infty)$

**Answer: C**



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18. For the principal value, evaluate

$$\sin^{-1}\left(-\frac{\sqrt{3}}{2}\right) - 2\sec^{-1}\left(2\tan\left(\frac{\pi}{6}\right)\right)$$

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

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

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

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

**Answer: B**

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**19.** The value of

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

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

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

C. 0

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

**Answer: C**

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20. If

$$\cos ec^{-1}x + \cos ec^{-1}y + \cos ec^{-1}z = -\frac{3\pi}{2}, \text{ then } \frac{x}{y} + \frac{y}{z} + \frac{z}{x} =$$

A. 1

B. -3

C. 3

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

**Answer: C**



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21. The value of

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

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

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

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

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

**Answer: A**



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22. The value of  $\sin^{-1}\{\sin(-600^\circ)\}$  is

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

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

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

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

**Answer: A**



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23. Find the principal value of  $[\cos^{-1} \cos(-680^\circ)]$

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

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

C.  $\frac{4\pi}{9}$

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

**Answer: B**



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**24.** The value of  $\sin^{-1}(\sin 10)$  is

A.  $3\pi - 10$

B.  $10 - 3\pi$

C.  $3\pi + 10$

D.  $4\pi - 10$

**Answer: A**



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25. The value of  $\cos^{-1}(\cos 10)$  is

A.  $4\pi - 10$

B.  $10 - 4\pi$

C.  $3\pi - 10$

D.  $10 - 3\pi$

**Answer: A**



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26. The value of  $\tan^{-1} \tan(-6)$  is

A.  $2\pi - 6$

B.  $2\pi + 6$

C.  $6 - 2\pi$



D.  $3\pi - 6$

**Answer: A**

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27. The value of  $\sin^{-1} \left\{ \cot \left( \sin^{-1} \sqrt{\frac{2 - \sqrt{3}}{4}} + \frac{\cos^{-1}(\sqrt{12})}{4} + \sec^{-1} \sqrt{2} \right) \right\}$  is equal to  $\frac{\pi}{4}$  (b)  $\frac{\pi}{2}$  (c) 0 (d)  $-\frac{\pi}{2}$

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

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

C. 0

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

**Answer:**

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

A.  $\frac{3\sqrt{15} - \sqrt{7}}{16}$

B.  $\frac{3\sqrt{15} + \sqrt{7}}{16}$

C.  $\frac{\sqrt{7} - 3\sqrt{15}}{16}$

D.  $\frac{3\sqrt{15} - \sqrt{7}}{4}$

Answer: A



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

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

A.  $\frac{48}{65}$

B.  $\frac{15}{65}$

C.  $\frac{33}{65}$

D.  $\frac{63}{65}$

**Answer:**



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

A. 1

B.  $\frac{\sqrt{12}}{3}$

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

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

**Answer: A**



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31. The value of

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

A. 5

B. 10

C. 15

D. 20

**Answer: C**



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32. The value of

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

A. 5

B. 10

C. 11

D. 15

**Answer: C**



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33. Value of  $\tan^{-1} \left\{ \sin \left( \cos^{-1} \sqrt{\frac{2}{3}} \right) \right\}$  is

A.  $\pi/4$

B.  $\pi/2$

C.  $\pi/3$

D.  $\pi/6$

**Answer: D**



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34. If  $\alpha = 3 \sin^{-1}\left(\frac{6}{11}\right)$  and  $\beta = 3 \cos^{-1}\left(\frac{4}{9}\right)$ , where the inverse trigonometric functions take only the principal values, then the correct option(s) is (are)

A.  $\cos \beta > 0$

B.  $\sin \beta < 0$

C.  $\cos(\alpha + \beta) > 0$

D.  $\cos \alpha < 0$

**Answer:**



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

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

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

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

D.  $\pi$

**Answer: B**



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**36.** If  $4 \sin^{-1} x + \cos^{-1} x = \pi$ , then  $x$  is equal to

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

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

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

D. none of these

**Answer: A**



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**37.**  $\tan(\cot^{-1} x)$  is equal to

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

B.  $\cot(\tan^{-1} x)$

C.  $\tan x$

D. none of these

**Answer: B**

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38. The principal values of  $\cos^{-1}\left(-\frac{\sin(7\pi)}{6}\right)$  is

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

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

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

D. none of these

**Answer: C**

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39. If  $\tan^{-1} x + 2 \cot^{-1} x = \frac{2\pi}{3}$  then  $x =$

A. 3

B.  $\sqrt{3}$

C.  $\sqrt{2}$

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

**Answer: B**



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

A. 0

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

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

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

**Answer: D**



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41. If  $x > y > 0$ , then find the value of  $\tan^{-1} \frac{x}{y} + \tan^{-1} \left[ \frac{x+y}{x-y} \right]$

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

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

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

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

**Answer: C**



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

A.  $\sqrt{ab}$

B.  $\sqrt{2ab}$

C.  $2ab$

D.  $ab$

**Answer: A**



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43. If  $\tan^{-1} 3 + \tan^{-1} x = \tan^{-1} 8$  then  $x =$

A. 5

B.  $\frac{1}{5}$

C.  $\frac{5}{14}$

D.  $\frac{14}{5}$

**Answer: B**



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44. The value of  $\sum_{n=1}^3 \tan^{-1}\left(\frac{1}{n}\right)$  is

A. 0

B.  $\pi$

C.  $\pi/2$

D. none of these

**Answer: C**



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45. If  $\tan^{-1}\left(\frac{1-x}{1+x}\right) = \frac{1}{2}\tan^{-1}x$  then the value of  $x$  is

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

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

C.  $\sqrt{3}$

D. 2

**Answer: B**



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46. If  $x > 0$ ,  $y > 0$  and  $x > y$  then  $\tan^{-1}\left\{\frac{x}{y}\right\} + \tan^{-1}\left\{\frac{x+y}{x-y}\right\}$  is

equal to

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

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

C.  $\frac{3\pi}{4}$

D. none of these

**Answer: C**



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47. The value of

$\cot \left[ \left\{ \sum_{n=1}^{23} \left\{ \cot^{-1} 1 + \sum_{k=1}^n 2k \right\} \right\} \right]$  is

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

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

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

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

**Answer:**



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48. The number of positive solution satisfying the equation

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



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49. If  $\cos^{-1}\left(\frac{3}{5}\right), \beta = \tan^{-1}\left(\frac{1}{3}\right)$ , where  
 $-1 \leq x \leq 1, -2 \leq y \leq 2, x \leq \frac{y}{2}$ , then for all  
 $x, y, 4x^2 - 4xy \cos \alpha + y^2$  is equal to

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

B.  $4 \sin^2 \alpha$

C. 4

D.  $2 \sin 2\alpha$

**Answer:**

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

A. 36

B.  $-36 \sin^2 \theta$

C.  $36 \sin^2 \theta$

D.  $36 \cos^2 \theta$

**Answer: C**



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

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

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

C.  $\frac{x^2}{a^2} + \frac{2xy}{ab} \cos \alpha + \frac{y^2}{b^2} = \sin^2 \alpha$

D.  $\frac{x^2}{a^2} + \frac{2xy}{ab} \sin \alpha + \frac{y^2}{b^2} = \cos^2 \alpha$

**Answer: C**



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52. If  $|a| < 1$ ,  $|b| < 1$  and  $|x| < 1$  then the solution of  $\sin^{-1}\left(\frac{2a}{1+a^2}\right) - \cos^{-1}\left(\frac{1-b^2}{1+b^2}\right) = \tan^{-1}\left(\frac{2x}{1-x^2}\right)$  is

A.  $\frac{a-b}{1-ab}$

B.  $\frac{1+ab}{a-b}$

C.  $\frac{ab-1}{a+b}$

D.  $\frac{a-b}{a+ab}$

Answer:



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53. If  $\sin^{-1}\left(\frac{3}{x}\right) + \sin^{-1}\left(\frac{4}{x}\right) = \frac{\pi}{2}$  then  $x =$

A. 3

B. 5

C. 7

D. 11

**Answer: B**

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54. The value of  $x$  where  $x > 0$  and  $\tan\left(\sec^{-1}\left(\frac{1}{x}\right)\right) = \sin(\tan^{-1} 2)$

is

A.  $\sqrt{5}$

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

C. 1

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

**Answer: B**

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

A.  $\frac{12}{13}$

B.  $\frac{13}{14}$

C.  $\frac{14}{15}$

D. none of these

**Answer: C**



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## Section I Solved Mcqs

1. If  $\theta \in \left[\frac{\pi}{2}, 3\frac{\pi}{2}\right]$  then  $\sin^{-1}(\sin \theta)$  equals

A.  $\theta$

B.  $\pi - \theta$

C.  $2\pi - \theta$

D.  $-\pi + \theta$

**Answer: B**



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2.  $\tan^{-1}(\tan \sqrt{1 - \theta}) = \sqrt{1 - \theta}$  when

A.  $-\frac{\pi}{2} < \theta < \frac{\pi}{2}$

B.  $\theta > \frac{4 - \pi}{4}$

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

D.  $\frac{4 - \pi^2}{4} < \theta \leq 1$

**Answer:**



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3. A root of the equation  $17x^2 + 17x \tan \left[ 2 \tan^{-1} \left( \frac{1}{5} \right) - \frac{\pi}{4} \right] - 10 = 0$

is (i)  $\frac{10}{17}$  (ii)  $-1$  (iii)  $-\frac{7}{17}$  (iv)  $1$

A.  $\frac{10}{17}$

B.  $-1$

C.  $-\frac{7}{17}$

D.  $1$

**Answer:**



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4. The set of values of  $x$  for which

$$\frac{\tan^{-1}(x)}{\sqrt{1-x^2}} = \sin^{-1} x \text{ holds is}$$

A.  $\mathbb{R}$

B.  $(-1, 1)$

C.  $(0, 1)$

D.  $[-1, 0]$

**Answer:**

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

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

B.  $x \in R$

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

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

**Answer:**

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6. If  $x \in \left[-\frac{1}{2}, 1\right]$  then  $\sin^{-1}\left(\frac{\sqrt{3}}{2}x - \frac{1}{2}\sqrt{1-x^2}\right)$

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

B.  $\sin^{-1} x - \frac{\pi}{6}$

C.  $\sin^{-1} x + \frac{\pi}{6}$

D. none of these

**Answer:**



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7.  $\operatorname{cosec}^{-1}(\cos x)$  is defined if

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

B.  $x \in R$

C.  $x = (2n + 1)\frac{\pi}{2}, n \in z$

D.  $x = n\pi, n \in z$

**Answer: D**



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8. If  $0 < x < 1$ , then  $\tan^{-1}\left(\frac{\sqrt{1-x^2}}{1+x}\right)$  is equal to

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

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

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

D. all the above

**Answer:**



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9.  $\sin^{-1}\left\{\frac{\sin(2x^2+4)}{x^2+1}\right\} = < \pi - 3$  if

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



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

C.  $x \in (-1, 1)$

D.  $x \in (1, \infty)$

**Answer:**

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10.  $\cos \left[ \tan^{-1} \left\{ \tan \left( \frac{15\pi}{4} \right) \right\} \right]$

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

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

C. 1

D. none of these

**Answer: A**

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11. If  $\sum_{r=1}^n \cos^{-1} x_r = 0$ , then  $\sum_{r=1}^n x_r$  equals

A. 0

B. n

C.  $\frac{n(n+1)}{2}$

D. none of these

**Answer:**



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12. If  $\sum_{r=1}^{2n} \sin^{-1} x^r = n\pi$ , then  $\sum_{r=1}^{2n} x^r$  is equal to

A. n

B. 2n

C.  $\frac{n(n+1)}{2}$

D. none of these

**Answer:**



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**13.**

**If**

$$\sin^{-1}\left(x - \frac{x^2}{2} + \frac{x^3}{4} - \dots\right) + \cos^{-1}\left(x^2 - \frac{x^4}{2} + \frac{x^6}{4} - \dots\right) = \frac{\pi}{2}$$

for  $0 < |x| < \sqrt{2}$  then  $x =$

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

B. 1

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

D. -1

**Answer: B**



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14. If  $\sin^{-1} \sqrt{x^2 + 2x + 1} + \sec^{-1} \sqrt{x^2 + 2x + 1} = \frac{\pi}{2}$ ;  $x \neq 0$ , then the value of  $2 \sec^{-1} \left( \frac{x}{2} \right) + \sin^{-1} \left( \frac{x}{2} \right)$  is equal to

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

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

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

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

**Answer: C**

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15. if  $\cos^{-1} x > \sin^{-1} x$ , then  $x$  belongs to the interval

A.  $(-\infty, 0) - 1, 0)$

B.  $(-1, 0)$

C.  $\left[ \left( 0, \frac{1}{\sqrt{2}} \right) \right)$

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

**Answer: D**

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16. The set of values of  $x$ , satisfying the equation  $\tan^2(\sin^{-1} x) > 1$  is -

A.  $[-1, 1]$

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

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

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

**Answer: C**

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17. If  $\cot^{-1}\left(\frac{n}{\pi}\right) > \frac{\pi}{6}$ ,  $n \in \mathbb{N}$ , then the maximum value of  $n$  is :

A. 1

B. 5

C. 9

D. none of these

**Answer: B**



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18. if  $6 \sin^{-1}(x^2 - 6x + 12) = 2\pi$ , then the value of  $x$ , is

A. 1

B. 2

C. 3

D. does not exist

**Answer: D**



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19. Which of the following is the solution set of the equation

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

A.  $\left[0, \frac{1}{3}\right]$

B.  $\left[\frac{1}{3}, \frac{2}{3}\right]$

C.  $\left[0, \frac{2}{3}\right]$

D. none of these

**Answer:**



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20. If  $\log_2 x \geq 0$  then  $\log_{1/\pi} \left\{ \sin^{-1} \left( \frac{2x}{1+x^2} \right) + 2 \tan^{-1} x \right\}$  is equal

A.  $\log_{1/\pi} (4 \tan^{-1} x)$

B. 0

C. -1

D. none of these

**Answer:**

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21. The value of  $a$  for which  $ax^2 + \sin^{-1}(x^2 - 2x + 2) + \cos^{-1}(x^2 - 2x + 2) = 1$  has a real solution is  $\frac{\pi}{2}$  (b)  $-\frac{\pi}{2}$  (c)  $\frac{2}{\pi}$  (d)  $-\frac{2}{\pi}$

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

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

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

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

**Answer:**

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22. The value of  $x$  that satisfies  $\tan^{-1}(\tan x - 3) = \tan^2 x$  is

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

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

C.  $\sqrt{\tan^{-1} 3}$

D. none of these

**Answer:**



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23. If  $\cos^{-1}\left(\frac{n}{2\pi}\right) > \frac{2\pi}{3}$  then maximum and minimum values of integer  $n$  are respectively

A.  $-6$  and  $-3$

B.  $-6$  and  $-4$

C.  $3$  and  $6$

D.  $4$  and  $6$

**Answer:**



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**24.** The set of values of  $k$  for which  $x^2 - kx + \sin^{-1}(\sin 4) > 0$  for all real  $x$  is

A.  $\phi$

B.  $(-2, 2)$

C.  $\mathbb{R}$

D. none of these

**Answer:**



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**25.** The set of values of  $x$  satisfying  $|\sin^{-1} x| < |\cos^{-1} x|$ , is

A.  $[-1, 1/\sqrt{2})$

B.  $[-1, 1/\sqrt{2}] \cup [1/\sqrt{2}, 1]$

C.  $(-1, 1/\sqrt{2})$

D. none of these

**Answer: A**



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**26.** If  $[\cot^{-1} x] + [\cos^{-1} x] = 0$  , where  $[ \ ]$  denotes the greatest integer functions, then the complete set of values of  $x$  is

A.  $(\cos 1, 1]$

B.  $(\cos 1, \cot 1)$

C.  $(\cot 1, 1]$

D. none of these

**Answer:**

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27. The number of real solutions of

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

- A. 0
- B. 1
- C. 2
- D. infinite

**Answer: C**

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28. The number of real solutions of the equation

$$\sqrt{1 + \cos 2x} = \sqrt{2} \sin^{-1}(\sin x), \quad -\pi \leq x \leq \pi \text{ is}$$

- A. 0

B. 1

C. 2

D. infinite

**Answer:**



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**29.** The number of solution of

$$\sin\left\{\sin^{-1}\left(\log_{1/2} x\right)\right\} + 2\left|\cos\left\{\sin^{-1}\left(\frac{x}{2} - \frac{3}{2}\right)\right\}\right| = 0 \text{ is}$$

A. 1

B. 2

C. 3

D. none of these

**Answer: A**



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30. The value of  $\tan(\sin^{-1}(\cos(\sin^{-1} x)))\tan(\cos^{-1}(\sin(\cos^{-1} x)))$ , where  $x \in (0, 1)$ , is equal to 0 (b) 1 (c)  $-1$  (d) none of these

A. 0

B. 1

C.  $-1$

D. none of these

**Answer:**

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31. Value of  $x$  satisfying  $\tan(\sec^{-1} x) = \sin\left(\cos^{-1}\left(\frac{1}{\sqrt{5}}\right)\right)$

A.  $\pm \frac{\sqrt{5}}{3}$

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

C.  $\pm \frac{\sqrt{3}}{5}$

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

**Answer: D**



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**32.** Exhaustive set of values of parameter 'a' so that  $\sin^{-1} x - \tan^{-1} x = a$  has a solution is

A.  $[-\pi/6, \pi/6]$

B.  $[-\pi/4, \pi/4]$

C.  $(-\pi/2, \pi/2)$

D. none of these

**Answer:**



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33. If  $\alpha \leq \sin^{-1} x + \cos^{-1} x + \tan^{-1} x \leq \beta$  then

A.  $\alpha = \frac{\pi}{4}, \beta = \frac{3\pi}{4}$

B.  $\alpha = -\pi, \beta = 2\pi$

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

D. none of these

Answer:



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34. If  $-1 \leq x \leq 0$  then  $\sin^{-1} x$  equals

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

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

C.  $-\cot^{-1} \left( \frac{\sqrt{1 - x^2}}{x} \right)$

D. none of these



**Answer:**



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35. If  $\tan^{-1}\left(\frac{x+1}{x-1}\right) + \tan^{-1}\left(\frac{x-1}{x}\right) = \tan^{-1}(-7) + \pi$  then  $x =$

A. 2

B. 3

C. 4

D. none of these

**Answer: A**



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36. The value of

$$\frac{\tan^{-1} 1}{3} + \frac{\tan^{-1} 1}{7} + \frac{\tan^{-1} 1}{13} + \dots + \frac{\tan^{-1}(1)}{n^2 + n + 1} + \dots \rightarrow \infty =$$

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

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

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

D. 0

**Answer: B**



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37. If  $0 \leq x \leq 1$  then  $\tan \left\{ \frac{1}{2} \sin^{-1} \left( \frac{2x}{1+x^2} \right) + \frac{1}{2} \cos^{-1} \left( \frac{1-x^2}{1+x^2} \right) \right\}$  is

equal to

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

B. 0

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

D. x

**Answer: A**



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38. If  $-1 \leq x \leq 0$  then  $\tan \left\{ \frac{1}{2} \sin^{-1} \left( \frac{2x}{1+x^2} \right) + \frac{1}{2} \cos^{-1} \left( \frac{1-x^2}{1+x^2} \right) \right\}$

is equal to

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

B. 0

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

D. x

Answer:



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39. If  $0 \leq x \leq 1$  then  $\sin \left\{ \tan^{-1} \left( \frac{1-x^2}{2x} \right) + \cos^{-1} \left( \frac{1-x^2}{1+x^2} \right) \right\}$  is

equal to

A. 1

B.  $-1$

C.  $0$

D. none of these

**Answer: A**



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40. If  $-1 \leq x \leq 0$  then  $\sin\left\{\tan^{-1}\left(\frac{1-x^2}{2x}\right) - \cos^{-1}\left(\frac{1-x^2}{1+x^2}\right)\right\}$  is

equal to

A.  $1$

B.  $-1$

C.  $0$

D. none of these

**Answer:**



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41. If  $\left| \cos^{-1} \left( \frac{1-x^2}{1+x^2} \right) \right| < \frac{\pi}{3}$ , then  $x$  belongs to the interval

A.  $\left[ -1/\sqrt{3}, 1/\sqrt{3} \right]$

B.  $\left( -1/\sqrt{3}, 1/\sqrt{3} \right)$

C.  $\left( 0, 1/\sqrt{3} \right)$

D. none of these

**Answer:**



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42. The value of  $\cos \left[ \tan^{-1} \left\{ \sin \left( \cot^{-1} x \right) \right\} \right]$  is

A.  $\frac{\sqrt{x^2 + 2}}{x^2 + 3}$

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

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

D. none of these

**Answer:**



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

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

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

C.  $\frac{3\pi}{4}$

D. 0

**Answer: B**



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**44.** If  $(\sin^{-1} x)^2 + (\cos^{-1} x)^2 = \frac{5\pi^2}{8}$  then  $x =$

A.  $\pm 1$

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

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

D. none of these

**Answer: D**



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45.  $\tan\left\{\frac{\pi}{4} + \frac{1}{2}\cos^{-1}\alpha\right\} + \tan\left\{\frac{\pi}{4} - \frac{1}{2}\cos^{-1}\alpha\right\}$

$\alpha \neq 0$  is equal to

A.  $\alpha$

B.  $2\alpha$

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

D. none of these

**Answer: C**



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46. The solution set of the equation

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

A.  $[-1, 1]$

B.  $[0, 1/2]$

C.  $[-1, 0]$

D. none of these

Answer:



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47. The number of triple satisfying  $\sin^{-1} x + \cos^{-1} y + \sin^{-1} z = 2\pi$  is

A. 0

B. 2



C. 1

D. infinite

**Answer:**

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48. If  $\sin^{-1}(\sin 5) > x^2 - 4x$  then

A.  $x \in (2 + \sqrt{9 - 2\pi}, \infty)$

B.  $x \in (2 - \sqrt{9 - 2\pi}, 2 + \sqrt{9 - 2\pi})$

C.  $x \in (2 - \sqrt{9 - 2\pi}, \infty)$

D. none of these

**Answer: B**

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49. If  $\cos^{-1}(\cos 4) > 3x^2 - 4x$  then

A.  $x \in \left( -\infty, \frac{2 - \sqrt{6\pi - 8}}{3} \right)$

B.  $x \in \left( \frac{2 + \sqrt{6\pi - 87}}{3}, \infty \right)$

C.  $x \in \left( \frac{2 + \sqrt{6\pi - 8}}{3}, \infty \right)$

D.  $x \in \left( \frac{2 - \sqrt{6\pi - 8}}{3}, \frac{2 + \sqrt{6\pi - 8}}{3} \right)$

Answer:  $\infty$



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50. The number of real solution  $(x,y)$  where

$$|y| = \sin x, y = \cos^{-1}(\cos x), -2\pi \leq x \leq 2\pi \text{ is}$$

A. 2

B. 1

C. 3

D. 4

**Answer: C**

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51. If  $u = \cot^{-1} \sqrt{\cos \theta} - \tan^{-1} \sqrt{\cos \theta}$  then  $\sin u =$

A.  $\sin^2 \theta$

B.  $\cos^2 \theta$

C.  $\tan^2 \theta$

D.  $\tan^2 2\theta$

**Answer: C**

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52.  $\tan(\sec^{-1} x) = \sin\left(\cos^{-1}\left(\frac{1}{\sqrt{5}}\right)\right)$

A.  $\pm \frac{3}{\sqrt{5}}$

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

C.  $\pm \sqrt{\frac{3}{5}}$

D. none of these

**Answer: A**



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53. Number of integral solutions of the equation

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

A. 1

B. 0

C. 2

D.  $\infty$

**Answer:**



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54. If  $\alpha, \beta$  and  $\gamma$  are the three angles with  $\alpha = 2 \tan^{-1}(\sqrt{2} - 1)$ ;  $\beta = 3 \sin^{-1}\left(\frac{1}{\sqrt{2}}\right) + \sin^{-1}\left(-\frac{1}{2}\right)$  and  $\gamma = \cos^{-1}\left(\frac{1}{3}\right)$ , then

A.  $\alpha < \beta < \gamma$

B.  $\alpha < \gamma < \beta$

C.  $\beta < \gamma < \alpha$

D.  $\gamma < \beta < \alpha$

Answer:



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55. If  $f(x) = \cos^{-1} x + \cos^{-1} \left\{ \left( \frac{x}{2} + \frac{1}{2} \sqrt{3 - 3x^2} \right) \right\}$

then  $f\left(\frac{2}{3}\right)$  equals

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

B.  $2\frac{\cos^{-1} 2}{3} - \frac{\pi}{3}$

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

D.  $2\cos^{-1} \frac{2}{3}$

**Answer: A**



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**56.** The trigonometric equation  $\sin^{-1} x = 2 \sin^{-1} a$  has a solution for all

real values (b)  $|a| < \frac{1}{a}$   $|a| \leq \frac{1}{\sqrt{2}}$  (d)  $\frac{1}{2} < |a| < \frac{1}{\sqrt{2}}$

A.  $|a| \leq \frac{1}{\sqrt{2}}$

B.  $\frac{1}{2} < |a| < \frac{1}{\sqrt{2}}$

C. all real values of a

D.  $|a| < \frac{1}{2}$

**Answer:**



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57. If  $\alpha$  is the only real root of the equation  $x^3 + bx^2 + cx + 1 = 0$  ( $b < c$ ), then the value of  $\tan^{-1} \alpha + \tan^{-1}(\alpha^{-1})$  is equal to :

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

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

C. 0

D. non existent

Answer:



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58. If  $\tan^{-1}\left(\frac{a}{x}\right) + \tan^{-1}\left(\frac{b}{x}\right) + \tan^{-1}\left(\frac{c}{x}\right) + \tan^{-1}\left(\frac{d}{x}\right) = \frac{\pi}{2}$   
then  $x^4 - x^2(\Sigma ab) + abcd =$

A.  $-1$

B.  $0$

C.  $1$

D.  $2$

**Answer: B**



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59. If  $u = \cot^{-1} \sqrt{\cos \theta} - \tan^{-1} \sqrt{\cos \theta}$  then  $\sin u =$

A.  $\tan \theta / 2$

B.  $\tan^2 \theta / 2$

C.  $\cot \theta / 2$

D.  $\cot^2 \theta / 2$

**Answer:**



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60. If  $\sin^{-1} x + \sin^{-1} y + \sin^{-1} z = \pi$  then the value of

$$x\sqrt{1-x^2} + y\sqrt{1-y^2} + z\sqrt{1-z^2}$$

A.  $2xyz$

B.  $x^2 + y^2 + z^2$

C.  $xy + yz + zx$

D. none of these

**Answer: A**



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61. if  $\cos^{-1} \sqrt{p} + \cos^{-1} \sqrt{1-p} + \cos^{-1} \sqrt{1-q} = \frac{3\pi}{4}$ , then the value

of q is (A) 1 (B)  $\frac{1}{\sqrt{2}}$  (C)  $\frac{1}{3}$  (D)  $\frac{1}{2}$

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

B. 1

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

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

**Answer:**



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62. The solution set of the equation  $\sin^{-1} x = 2 \tan^{-1} x$  is

A.  $\{1, 2\}$

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

C.  $\{-1, 1, 0\}$

D.  $\{1, 1/2, 0\}$

**Answer: C**



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63. If  $\cot(\cos^{-1} x) = \sec\left\{\tan^{-1}\left(\frac{a}{\sqrt{b^2 - a^2}}\right)\right\}$  then x equals

A.  $\frac{b}{s}qr(2b^2 - a^2)$

B.  $\frac{a}{s}qr(2b^2 - a^2)$

C.  $\frac{\sqrt{b^2 - a^2}}{a}$

D.  $\frac{b}{\sqrt{2b^2 - a^2}}$

Answer: D



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64.  $\frac{\tan^{-1}(C_1x - y)}{c_1 + c_3c_2} + \dots + \frac{\tan^{-1}(1)}{c_n}$  is equal to

A.  $\frac{\tan^{-1}(y)}{x}$

B.  $\tan^{-1}\left(\frac{x}{y}\right)$

C.  $-\frac{\tan^{-1}(x)}{y}$

D. none of these

**Answer: B**



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65. If  $0 < x < 1$  then

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

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

B.  $x$

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

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

**Answer:**



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66.  $\sum_{r=1}^{\infty} \frac{\tan^{-1}(1)}{2r^2} = t$  then  $\tan t$  is equal to

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

B. 1

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

D. none of these

**Answer:**



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**67.** Let  $(x,y)$  be such that

$$\sin^{-1}(ax) + \cos^{-1}y + \cos^{-1}(bxy) = \frac{\pi}{2}$$

If  $a=1$  and  $b=2$  then  $(x,y)$  lies on

A.  $x^2 + y^2 = 1$

B.  $(x^2 - 1)(y^2 - 1) = 0$

C.  $y=x$

D.  $(4x^2 - 1)(y^2 - 1) = 0$

**Answer:**



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**68.** Let  $f: [0, 4\pi] \rightarrow [0, \pi]$  be defined by  $f(x) = \cos^{-1}(\cos x)$ . The number of points  $x \in [0, 4\pi]$  satisfying the equation  $f(x) = \frac{10 - x}{10}$  is

A. 2

B. 3

C. 4

D. 5

**Answer:**



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**69.** If  $(\sin^{-1} x + \sin^{-1} y)(\sin^{-1} z + \sin^{-1} w) = \pi^2$  and  $n_1, n_2, n_3, n_4$

in N value of  $\begin{vmatrix} x^{n_1} & y^{n_2} \\ z^{n_3} & w^{n_4} \end{vmatrix}$  cannot be equal to

A. -2

B. 0

C. 1

D. 2

**Answer:**



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**70.**

If

$$\sin^{-1} x + \sin^{-1} y + \sin^{-1} z = \pi, \text{ then } x^4 + y^2 + z^4 + 4x^2y^2z^2 = K(x^2y^2z^2)$$

where  $K$  is equal to 1 (b) 2 (c) 4 (d) none of these

A. 1

B. 2

C. 4

D. none of these

**Answer:**



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71. Let  $\tan^{-1} y = \tan^{-1} x + \tan^{-1} \left( \frac{2x}{1-x^2} \right)$ , where  $|x| < \frac{1}{\sqrt{3}}$ . Then a value of  $y$  is :

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

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

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

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

**Answer: C**



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**Section II Assertion Reason Type**



1. Statement -1: If  $x < \sqrt{e}$  then

$$\cot^{-1} \left\{ \frac{\log(e/x^2)}{\log(ex^2)} \right\} + \cot^{-1} \left\{ \frac{\log(ex^4)}{\log(e^2/x^2)} \right\} = \pi - \tan^{-1} 3$$

statement 2:  $\frac{\tan^{-1}(x+y)}{1-xy} = \tan^{-1} x + \tan^{-1} y$  if  $xy < 1$

A. Statement-1 is True, Statement-2 is true, Statement-2 is a correct explanation for Statement-1.

B. Statement-1 is True, Statement-2 is True, Statement-2 is not a correct explanation for Statement-1.

C. Statement-1 is True, Statement-2 is False.

D. Statement-1 is False, Statement-2 is True.

**Answer:**

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2. Statement -1: If  $\xi \in \left[ -1/\sqrt{3}, 1/\sqrt{3} \right]$  then

$$\cot^{-1} \left( \frac{3x - x^3}{1 - 3x^2} \right) = \cos^{-1} \left( \frac{1 - x^2}{1 + x^2} \right) \rightarrow x = \frac{\sqrt{25 - 10\sqrt{5}}}{5}$$

statement -2:  $\sin 18^\circ = \frac{\sqrt{5}-1}{4}$  and  $\cos 18^\circ = \frac{\sqrt{10+2\sqrt{5}}}{4}$

- A. Statement-1 is True, Statement-2 is true, Statement-2 is a correct explanation for Statement-1.
- B. Statement-1 is True, Statement-2 is True, Statement-2 is not a correct explanation for Statement-1.
- C. Statement-1 is True, Statement-2 is False.
- D. Statement-1 is False, Statement-2 is True.

**Answer:**



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**3. Statement-1:** if  $\frac{1}{2} \leq x \leq 1$  then

$$\cos^{-1} x - \sin^{-1} \left\{ \frac{x}{2} + \frac{\sqrt{3-3x^2}}{2} \right\} \text{ is equal to } \frac{\pi}{5}$$

**Statement-2:**

$$\sin^{-1} \left( 2x\sqrt{1-x^2} \right) = 2\sin^{-1} x \text{ if } x \in - (1)\sqrt{2}, (1)\sqrt{2}$$

A. Statement-1 is True, Statement-2 is true, Statement-2 is a correct explanation for Statement-1.

B. Statement-1 is True, Statement-2 is True, Statement-2 is not a correct explanation for Statement-1.

C. Statement-1 is True, Statement-2 is False.

D. Statement-1 is False, Statement-2 is True.

**Answer:**



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4.

Statement-1:

$$\cos^{-1} \frac{3}{2} + \cos^{-1} \left( \frac{2}{3} \right) - 2 \cot^{-1} \left( \frac{1}{7} \right) - \cot^{-1} 7 = \cot^{-1} 7$$

Statement-2:

$$\cos^{-1} x = \sin^{-1} \left( \frac{1}{x} \right) \text{ and } f \text{ or } x > 0 \cot^{-1} x = \tan^{-1} \left( \frac{1}{x} \right)$$

A. Statement-1 is True, Statement-2 is true, Statement-2 is a correct explanation for Statement-1.

B. Statement-1 is True, Statement-2 is True, Statement-2 is not a correct explanation for Statement-1.

C. Statement-1 is True, Statement-2 is False.

D. Statement-1 is False, Statement-2 is True.

**Answer:**

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**5. Statement-1:**

$$\tan \left\{ \frac{\cos^{-1}(1)}{\sqrt{82}} - \frac{\sin^{-1}(5)}{\sqrt{26}} \right\} = \frac{29}{3}$$

$$\text{Statement-2: } \left[ x \cos(\cot^{-1})^2 = \frac{51}{50} \rightarrow x = \frac{1}{5} \sqrt{2} \right]$$

A. Statement-1 is True, Statement-2 is true, Statement-2 is a correct explanation for Statement-1.

B. Statement-1 is True, Statement-2 is True, Statement-2 is not a correct explanation for Statement-1.

C. Statement-1 is True, Statement-2 is False.

D. Statement-1 is False, Statement-2 is True.

**Answer:**



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6. Statement -1: If  $a$  is twice the tangent of the arithmetic mean of  $\sin^{-1} x$  and  $\cos^{-1} x$ ,  $b$  the geometric mean of  $\tan x$  and  $\cot x$  then

$$x^2 - ax + b = 0 \rightarrow x = 1 \text{ statement-2: } \tan\left(\frac{\sin^{-1} x + \cos^{-1} x}{2}\right) = 1$$

A. Statement-1 is True, Statement-2 is true, Statement-2 is a correct explanation for Statement-1.

B. Statement-1 is True, Statement-2 is True, Statement-2 is not a correct explanation for Statement-1.

C. Statement-1 is True, Statement-2 is False.

D. Statement-1 is False, Statement-2 is True.

**Answer:**



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7. Statement -1: If  $a^2 + b^2 = c^2, c \neq 0$  then the non zero solution of the equation  $\sin^{-1}\left(\frac{ax}{c}\right) + \sin^{-1}\left(\frac{bx}{c}\right) = \sin^{-1}x$  is  $\pm 1$ . Statement-2:  $\sin^{-1}x + \sin^{-1}y = \sin^{-1}(x + y)$

- A. Statement-1 is True, Statement-2 is true, Statement-2 is a correct explanation for Statement-1.
- B. Statement-1 is True, Statement-2 is True, Statement-2 is not a correct explanation for Statement-1.
- C. Statement-1 is True, Statement-2 is False.
- D. Statement-1 is False, Statement-2 is True.

**Answer:**



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8. Statement -1: if  $-1 \leq x \leq 1$  then  $\sin^{-1}(-x) = -\sin^{-1}x$  and  $\cos^{-1}(-x) = \pi - \cos^{-1}x$

Statement-2: If  $-1 \leq x \leq 1$  then  $\cos^{-1}x = 2\sin^{-1}\sqrt{\frac{1-x}{2}} = 2\cos^{-1}\sqrt{\frac{1+x}{2}}$

A. Statement-1 is True, Statement-2 is true, Statement-2 is a correct explanation for Statement-1.

B. Statement-1 is True, Statement-2 is True, Statement-2 is not a correct explanation for Statement-1.

C. Statement-1 is True, Statement-2 is False.

D. Statement-1 is False, Statement-2 is True.

Answer:



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9. Statement-1: If  $\alpha, \beta$  roots of the equation  $18(\tan^{-1} x)^2 - 9\pi \tan^{-1} x + \pi^2 = 0$  then  $\alpha + \beta = \frac{4}{\sqrt{3}}$  Statement-2:  $\sec^2 \cos^{-1}\left(\frac{1}{4}\right) + \operatorname{cosec}^2 \sin^{-1}\left(\frac{1}{5}\right) = 41$

- A. Statement-1 is True, Statement-2 is true, Statement-2 is a correct explanation for Statement-1.
- B. Statement-1 is True, Statement-2 is True, Statement-2 is not a correct explanation for Statement-1.
- C. Statement-1 is True, Statement-2 is False.
- D. Statement-1 is False, Statement-2 is True.

**Answer:**

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10. If

$$\sin^{-1}\left(x - \frac{x^2}{2} + \frac{x^3}{4} - \dots\right) + \cos^{-1}\left(x^2 - \frac{x^4}{2} + \frac{x^6}{4} - \dots\right) = \frac{\pi}{2}$$



for  $0 < |x| < \sqrt{2}$  then  $x =$

- A. Statement-1 is True, Statement-2 is true, Statement-2 is a correct explanation for Statement-1.
- B. Statement-1 is True, Statement-2 is True, Statement-2 is not a correct explanation for Statement-1.
- C. Statement-1 is True, Statement-2 is False.
- D. Statement-1 is False, Statement-2 is True.

**Answer:**



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11. Statement-1:  $\sin^{-1} \tan((\tan^{-1} x + \tan^{-1}(1-x))) = \frac{\pi}{2}$  has no non zero integral solution Statement-2: The greatest and least values of  $(\sin^{-1} x)^3 + (\cos^{-1} x)^3$  are  $\frac{(7\pi)^3}{8}$  and  $\frac{(\pi)^3}{32}$  respectively

- A. Statement-1 is True, Statement-2 is true, Statement-2 is a correct explanation for Statement-1.
- B. Statement-1 is True, Statement-2 is True, Statement-2 is not a correct explanation for Statement-1.
- C. Statement-1 is True, Statement-2 is False.
- D. Statement-1 is False, Statement-2 is True.

**Answer:**



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## Exercise

1. If  $\theta \in [4\pi, 5\pi]$  then  $\cos^{-1}(\cos \theta)$  equals

A.  $-4\pi + \theta$

B.  $5\pi - \theta$

C.  $4\pi - \theta$

D.  $\theta - 5\pi$

**Answer: A**



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2. If  $x < 0$  then  $\tan^{-1}\left(\frac{1}{x}\right)$  equals

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

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

C.  $-\pi + \cot^{-1} x$

D.  $-\pi - \cot^{-1} x$

**Answer: C**



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3. If  $\sin^{-1}(2x\sqrt{1-x^2}) - 2\sin^{-1}x = 0$  then  $x$  belongs to the interval

A.  $[-1, 1]$

B.  $[-1/\sqrt{2}, 1/\sqrt{2}]$

C.  $[-1, -1/\sqrt{2}]$

D.  $[1/\sqrt{2}, 1]$

**Answer: B**



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4.  $4\tan^{-1}\left(\frac{1}{5}\right) - \tan^{-1}\left(\frac{1}{239}\right)$  is equal to

A.  $\pi$

B.  $\pi/2$

C.  $\pi/3$

D.  $\pi/4$

**Answer: D**

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

A. 1

B. 0

C.  $4/5$

D.  $1/5$

**Answer: D**

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6. If  $A = \tan^{-1} x, x \in R$  then the value of  $\sin 2A$  is

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

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

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

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

**Answer: C**



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7.  $\sin(2 \sin^{-1} 0.8) =$

A.  $\sin 1.2^\circ$

B.  $\sin 1.6^\circ$

C. 0.478

D. 0.96

**Answer: D**



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8.  $\tan^{-1}\left(\frac{1}{4}\right) + \tan^{-1}\left(\frac{2}{9}\right) = \frac{1}{2}\tan^{-1}\left(\frac{4}{3}\right)$

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

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

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

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

**Answer: D**



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9. If  $\sin^{-1}\left(\frac{x}{5}\right) + \operatorname{cosec}^{-1}\left(\frac{5}{4}\right) = \frac{\pi}{2}$  then a value of x is:

A. 4

B. 5

C. 1

D. 3

**Answer: D**



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10. find the value of  $2 \tan^{-1}\left(\frac{1}{3}\right) + \tan^{-1}\left(\frac{1}{7}\right)$

A.  $\tan^{-1}\left(\frac{49}{29}\right)$

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

C. 0

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

**Answer: D**



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11.  $\cos^{-1}\left(\frac{15}{17}\right) + 2 \tan^{-1}\left(\frac{1}{5}\right) =$

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



B.  $\frac{\cos^{-1}(171)}{221}$

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

D. none of these

**Answer: D**



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

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

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

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

D. none of these

**Answer: D**



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13.  $\sin^{-1}\left(\frac{3}{5}\right) + \tan^{-1}\left(\frac{1}{7}\right) =$

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

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

C.  $\cos^{-1}\left(\frac{4}{5}\right)$

D.  $\pi$

**Answer: A**



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14. A solution of the equation

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

A.  $x=1$

B.  $x=-1$

C.  $x=0$

D.  $x = \pi$

**Answer: C**



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15. 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  $\pi$  (b)  $\frac{\pi}{2}$  (c) 0 (d) none of these

A.  $\pi$

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

C. 0

D. none of these

**Answer: B**



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16. If  $x + y + z = xyz$  and  $x, y, z > 0$ , then find the value of  $\tan^{-1} x + \tan^{-1} y + \tan^{-1} z$

A. 0

B.  $\pi/2$

C. 1

D. none of these

**Answer: A**



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17. If  $xy + yz + zx = 1$  then  $\tan^{-1} x + \tan^{-1} y + \tan^{-1} z =$

A.  $(\pi)$

B.  $\pi/2$

C. 1

D. none of these

**Answer: B**



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**18.** If  $x_1, x_2, x_3, x_4$  are the roots of the equation

$$x^4 - x^3 \sin 2\beta + x^2 \cdot \cos 2\beta - x \cos \beta - \sin \beta = 0, \quad \text{then}$$

$\tan^{-1} x_1 + \tan^{-1} x_2 + \tan^{-1} x_3 + \tan^{-1} x_4$  is equal to

A.  $\beta$

B.  $\pi/2 - \beta$

C.  $\pi - \beta$

D.  $-\beta$

**Answer: B**



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**19.** The value of  $\cos(2 \cos^{-1} 0.8)$  is

A. 0.48

B. 0.96

C. 0.6

D. none of these

**Answer: D**

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20. If  $0 \leq x \leq 1$  then  $\cos^{-1}(2x^2 - 1)$  equals

A.  $2 \cos^{-1} x$

B.  $\pi - 2 \cos^{-1} x$

C.  $2\pi - 2 \cos^{-1} x$

D. none of these

**Answer: B**

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21. The value of  $\tan \left[ \cos^{-1} \left( \frac{4}{5} \right) + \tan^{-1} \left( \frac{2}{3} \right) \right]$  is  $\frac{6}{17}$  (b)  $\frac{7}{16}$  (c)  $\frac{16}{7}$  (d)

none of these

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

B.  $\frac{7}{16}$

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

D. none of these

**Answer: C**

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22. The value of  $\tan \left[ \frac{1}{2} \cos^{-1} \cdot \frac{\sqrt{5}}{3} \right]$  is

A.  $\frac{3 + \sqrt{5}}{2}$

B.  $3 + \sqrt{5}$

C.  $\frac{1}{2}(3 - \sqrt{5})$

D. none of these

**Answer: C**

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

A.  $\frac{a-b}{1+ab}$

B.  $\frac{b}{1+ab}$

C.  $\frac{b}{1-ab}$

D.  $\frac{a+b}{a-b}$

**Answer: D**

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24. The value of  $\cot^{-1} \left\{ \frac{\sqrt{1 - \sin x} + \sqrt{1 + \sin x}}{\sqrt{1 - \sin x} - \sqrt{1 + \sin x}} \right\}$  is  $\left( 0 < x < \frac{\pi}{2} \right)$

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

B.  $2\pi - x$

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

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

**Answer: A**



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

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

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

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

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

**Answer: B**



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26. 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)  $\pi$

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

B. 0

C.  $\pi/2$

D.  $\pi$

**Answer: D**



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27. If  $A = \tan^{-1} \left( \frac{x\sqrt{3}}{2k-x} \right)$  and  $B = \tan^{-1} \left( \frac{2x-k}{k\sqrt{3}} \right)$  then find the value of

$A - B$  (A)  $0^\circ$  (B)  $30^\circ$  (C)  $60^\circ$  (D)  $45^\circ$

A.  $0^\circ$

B.  $45^\circ$

C.  $60^\circ$

D.  $30^\circ$

**Answer: D**



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**28.** If  $\sin^{-1} x + \sin^{-1}(1 - x) = \cos^{-1} x$  then  $x$  equals

A. 1,-1

B. 1,0

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

D. none of these

**Answer: C**



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29. If  $-1 \leq x \leq 0$  then  $\cos^{-1}(2x^2 - 1)$  equals

A.  $2 \cos^{-1} x$

B.  $\pi - 2 \cos^{-1} x$

C.  $2\pi - 2 \cos^{-1} x$

D.  $-2 \cos^{-1} x$

**Answer: D**



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30. If  $-\frac{1}{2} \leq x \leq \frac{1}{2}$  hence  $\sin^{-1}(3x - 4x^3)$  equals

A.  $3 \sin^{-1} x$

B.  $\pi - 3 \sin^{-1} x$

C.  $-\pi - 3 \sin^{-1} x$

D. none of these

**Answer: D**



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**31.** The value of  $\sin^{-1}(\sin 10)$  is

A. 10

B.  $10 - 3\pi$

C.  $3\pi - 10$

D. none of these

**Answer: C**



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**32.** The value of  $\tan^{-1} 1 + \tan^{-1} 2 + \tan^{-1} 3$  is

A. 0

B. 1

C.  $\pi$

D.  $-\pi$

**Answer: C**

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

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

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

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

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

**Answer: D**

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34. Find the smallest and the largest values of

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

A.  $0, \pi$

B.  $0, \frac{\pi}{4}$

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

D.  $\frac{\pi}{4}, \frac{\pi}{2}$

**Answer: B**



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35. The least and the greatest values of  $(\sin^{-1} x)^3 + (\cos^{-1} x)^3$  are

$\frac{-\pi}{2}, \frac{\pi}{2}$  (b)  $\frac{-\pi^3}{8}, \frac{\pi^3}{8}$   $\frac{\pi^3}{32}, \frac{7\pi^3}{8}$  (d) none of these

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

B.  $-\frac{\pi^3}{8}, \frac{\pi^3}{8}$

C.  $\frac{\pi^3}{32}, \frac{7\pi^3}{8}$

D. none of these

**Answer: C**



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36. If  $a \leq \frac{1}{32}$  then the number of solution of

$$(\sin^{-1} x)^3 + (\cos^{-1} x)^3 = a\pi^3 \text{ is}$$

A. 0

B. 1

C. 2

D. infinite

**Answer: A**



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37. If  $x$  takes negative permissible value then  $\sin^{-1} x =$

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

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

C.  $\cos^{-1} \sqrt{x^2 - 1}$

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

**Answer: B**



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38. If  $-1 \leq x \leq -\frac{1}{\sqrt{2}}$  then  $\sin^{-1} 2x\sqrt{1 - x^2}$  equals

A.  $2 \sin^{-1} x$

B.  $\pi - 2 \sin^{-1} x$

C.  $-\pi - 2 \sin^{-1} x$

D. none of these

**Answer: C**



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39. If  $\frac{1}{\sqrt{2}} \leq x \leq 1$  then  $\sin^{-1} 2x\sqrt{1-x^2}$  equals

A.  $2 \sin^{-1} x$

B.  $\pi - 2 \sin^{-1} x$

C.  $-\pi - 2 \sin^{-1} x$

D. none of these

**Answer: B**



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40. If  $0 \leq x \leq 1$  then  $\cos^{-1}(2x^2 - 1)$  equals

A.  $2 \cos^{-1} x$

B.  $\pi - 2 \cos^{-1} x$

C.  $2\pi - 2 \cos^{-1} x$

D. none of these

**Answer: A**

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41. If  $-1 \leq x \leq 0$  then  $\cos^{-1}(2x^2 - 1)$  equals

A.  $2 \cos^{-1} x$

B.  $\pi - 2 \cos^{-1} x$

C.  $2\pi - 2 \cos^{-1} x$

D.  $-2 \cos^{-1} x$

**Answer: C**

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42. If  $-\frac{1}{2} \leq x \leq \frac{1}{2}$  then  $\sin^{-1} 3x - 4x^3$  equals

A.  $3 \sin^{-1} x$

B.  $\pi - 3 \sin^{-1} x$

C.  $-\pi - 3 \sin^{-1} x$

D. none of these

**Answer: A**



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43. If  $\frac{1}{2} \leq x \leq 1$  then  $\sin^{-1} 3x - 4x^3$  equals

A.  $3 \sin^{-1} x$

B.  $\pi - 3 \sin^{-1} x$

C.  $-\pi - 3 \sin^{-1} x$

D. none of these

**Answer: B**



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44. If  $-1 \leq x \leq -\frac{1}{2}$ , then  $\sin^{-1}(3x - 4x^3)$  equals

A.  $3 \sin^{-1} x$

B.  $\pi - 3 \sin^{-1} x$

C.  $-\pi - 3 \sin^{-1} x$

D. none of these

**Answer: C**



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45. If  $\frac{1}{2} \leq x \leq 1$  then  $\cos^{-1}(4x^3 - 3x)$  equals

A.  $3 \cos^{-1} x$

B.  $2\pi - 3 \cos^{-1} x$

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

D. none of these

**Answer: A**



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46. if  $-\frac{1}{2} \leq x \leq \frac{1}{2}$  then  $\cos^{-1}(4x^3 - 3x)$  equals

A.  $3 \cos^{-1} x$

B.  $2\pi - 3 \cos^{-1} x$

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

D. none of these

**Answer: B**



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47. if  $-1 \leq x \leq -\frac{1}{2}$  then  $\cos^{-1}(4x^3 - 3x)$  equals

A.  $3 \cos^{-1} x$

B.  $2\pi - 3 \cos^{-1} x$

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

D. none of these

**Answer: C**



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48. If  $1 < x < 1$  then  $\frac{\tan^{-1}(2x)}{1-x^2}$  equals

A.  $2 \tan^{-1} x$

B.  $-\pi + 2 \tan^{-1} x$

C.  $\pi + 2 \tan^{-1} x$

D. none of these

**Answer: A**



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49. If  $x \in (1, \infty)$  then  $\frac{\tan^{-1}(2x)}{1-x^2}$  equals

A.  $2 \tan^{-1} x$

B.  $-\pi + 2 \tan^{-1} x$

C.  $\pi + 2 \tan^{-1} x$

D. none of these

**Answer: B**



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50. If  $x \in (-\infty, -1)$  then  $\frac{\tan^{-1}(2x)}{1-x^2}$  equals

A.  $2 \tan^{-1} x$



B.  $-\pi + 2 \tan^{-1} x$

C.  $\pi + 2 \tan^{-1} x$

D. none of these

**Answer: C**



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51. If  $-\frac{1}{\sqrt{3}} < x < \frac{1}{\sqrt{3}}$ , then  $\frac{\tan^{-1}(3x - x^3)}{1 - 3x^2}$  equals

A.  $3 \tan^{-1} x$

B.  $-\pi + 3 \tan^{-1} x$

C.  $\pi + 3 \tan^{-1} x$

D. none of these

**Answer: A**



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52. If  $x > \frac{1}{\sqrt{3}}$  then  $\frac{\tan^{-1}(3x - x^3)}{1 - 3x^2}$  equals

A.  $3 \tan^{-1} x$

B.  $-\pi + 3 \tan^{-1} x$

C.  $\pi + 3 \tan^{-1} x$

D. none of these

**Answer: B**



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53. If  $x < -\frac{1}{\sqrt{3}}$ , then  $\frac{\tan^{-1}(3x - x^3)}{1 - 3x^2}$  equals

A.  $3 \tan^{-1} x$

B.  $-\pi + 3 \tan^{-1} x$

C.  $\pi + 3 \tan^{-1} x$

D. none of these

**Answer: C**



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54. If  $0 \leq x < \infty$ , then  $\cos^{-1}\left(\frac{1-x^2}{1+x^2}\right)$  equals

A.  $2 \tan^{-1} x$

B.  $-2 \tan^{-1} x$

C.  $\pi - 2 \tan^{-1} x$

D.  $\pi + 2 \tan^{-1} x$

**Answer: A**



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55. If  $-\infty < x \leq 0$  then  $\cos^{-1}\left(\frac{1-x^2}{1+x^2}\right)$  equals

A.  $2 \tan^{-1} x$

B.  $-2 \tan^{-1} x$

C.  $\pi - 2 \tan^{-1} x$

D.  $\pi + 2 \tan^{-1} x$

**Answer: B**

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56. If  $x \in [-1, 1]$  then  $\sin^{-1}\left(\frac{2x}{1+x^2}\right)$  equals

A.  $2 \tan^{-1} x$

B.  $\pi - 2 \tan^{-1} x$

C.  $-\pi - 2 \tan^{-1} x$

D. none of these

**Answer: A**

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57. If  $x \in (1, \infty)$  then  $\sin^{-1}\left(\frac{2x}{1+x^2}\right)$  equals

A.  $2 \tan^{-1} x$

B.  $\pi - 2 \tan^{-1} x$

C.  $-\pi - 2 \tan^{-1} x$

D. none of these

**Answer: B**



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58. If  $x \in (-\infty, -1)$  then  $\sin^{-1}\left(\frac{2x}{1+x^2}\right)$  equals

A.  $2 \tan^{-1} x$

B.  $\pi - 2 \tan^{-1} x$

C.  $-\pi - 2 \tan^{-1} x$

D. none of these

**Answer: C**



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59. If  $\sin^{-1}\left(\frac{2x}{1+x^2}\right) + \cos^{-1}\left(\frac{1-x^2}{1+x^2}\right) = 4 \tan^{-1} x$  then

A.  $x \in -(-\infty, -1)$

B.  $x \in (1, \infty)$

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

D.  $x \in [-1, 0)$

**Answer: C**



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60. If  $2 \tan^{-1} x + \sin^{-1}\left(\frac{2x}{1+x^2}\right)$  is independent of  $x$  then :

A.  $x \in [1, \infty) \cup (-\infty, -1)$

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

C.  $x \in (-\infty, 1]$

D. none of these

**Answer: A**



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61. If  $\tan^{-1} x + \tan^{-1} y + \tan^{-1} z = \pi$  then  $x + y + z$  is equal to

A.  $xyz$

B. 0

C. 1

D.  $2xyz$

**Answer: A**



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62. The value of  $\cos(\tan^{-1}(\tan 2))$  is

- A.  $1/\sqrt{5}$
- B.  $-1/\sqrt{5}$
- C.  $\cos 2$
- D.  $-\cos 2$

**Answer: D**

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63. If  $\sec^{-1} x = \cos^{-1} y$  then  $\cos^{-1}\left(\frac{1}{x}\right) + \cos^{-1}\left(\frac{1}{y}\right) =$

- A.  $\pi$
- B.  $\frac{\pi}{4}$
- C.  $-\frac{\pi}{4}$
- D.  $\frac{\pi}{2}$



**Answer: D**



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64. Let  $\cos(2 \tan^{-1} x) = \frac{1}{2}$  then the value of  $x$  is

A.  $\sqrt{3}$

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

C.  $1 - \sqrt{3}$

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

**Answer: B**



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65. If  $\tan^{-1}\left(\frac{x}{\pi}\right) < \frac{\pi}{3}$ ,  $x \in N$  then the maximum value of  $x$  is

A. 2

B. 5

C. 7

D. none of these

**Answer: B**



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66. Range of the function  $f(x) = \cos^{-1}(-\{x\})$ , where  $\{.\}$  is fractional part function, is:

A.  $\left(\frac{\pi}{2}, 1\right)$

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

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

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

**Answer: C**



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67.  $\sec^{-1}(\sin x)$  exist if

A.  $x \in (-\infty, \infty)$

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

C.  $x = (2n + 1)\frac{\pi}{2}, x \in Z$

D.  $x = n\pi, x \in z$

**Answer: C**



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68. The value of  $\cot\left(\frac{\pi}{4} - 2 \cot^{-1} 3\right)$  is

A. 1

B. 7

C. -1

D. none of these

**Answer: B**



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69.  $[\cot^{-1} x][\cos^{-1} x] = 0$  where  $x$  is non negative and  $[\cdot]$  is the greatest integer function then the value of  $x$  is / are

A.  $(\cos 1, 1]$

B.  $(\cos 1, \cos 1)$

C.  $(\cot 1, 1]$

D. none of these

**Answer: D**



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70. The sum of the series  $\cot^{-1} 2 + \cot^{-1} 8 + \cot^{-1} 18 + \cot^{-1} 32 \dots$  is

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

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

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

D. none of these

**Answer: B**



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71. If  $\frac{\cos^{-1}(x)}{2} + \frac{\cos^{-1}(y)}{3} = \theta$  then the maximum of  $9x^2 - 12xy \cos \theta + 4y^2$  is

A. 18

B. 30

C. 24

D. 36

**Answer: D**



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72. If  $\sin^{-1} x + \sin^{-1} y + \sin^{-1} z = \pi$ , Prove

$$x\sqrt{1-x^2} + y\sqrt{1-y^2} + z\sqrt{1-z^2} = 2xyz$$

A.  $2xyz$

B.  $xyz$

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

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

Answer: A



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## Chapter Test

1. If  $\sin^{-1}(1-x) - 2\sin^{-1}x = \frac{\pi}{2}$  then x equal

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

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

C. 0

D. none of these

**Answer: C**



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

A.  $-1$

B. 1

C. 0

D. none of these

**Answer: A**



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3. If  $\tan \theta + \tan\left(\frac{\pi}{3} + \theta\right) + \tan\left(\frac{-\pi}{3} + \theta\right) = k \tan 3\theta$  then the value of

k is

A. 1

B.  $1/3$

C. 3

D. none of these

**Answer: C**



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4. If  $\frac{1}{2} \leq x \leq 1$  then  $\sin^{-1}(3x - 4x^3)$  equals

A.  $3 \sin^{-1} x$

B.  $\pi - 3 \sin^{-1} x$

C.  $-\pi - 3 \sin^{-1} x$



D. none of these

**Answer: B**



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5. The value of  $\tan \left( 2 \tan^{-1} \frac{1}{5} - \frac{\pi}{4} \right)$  is

A. 1

B. 0

C.  $\frac{7}{17}$

D.  $-\frac{7}{17}$

**Answer: D**



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6. If  $\tan(x + y) = 33$ , and  $x = \tan^{-1} 3$ , then:  $y =$

A. 0.3

B.  $\tan^{-1}(1.3)$

C.  $\tan^{-1}(0.3)$

D.  $\tan^{-1}\left(\frac{1}{18}\right)$

**Answer: C**



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7. Two angles of a triangle are  $\cot^{-1} 2$  and  $\cot^{-1} 3$ , then the third angle is

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

B.  $\frac{3\pi}{4}$

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

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

**Answer: B**



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8. If  $A = 2 \tan^{-1}(2\sqrt{2} - 1)$  and  $B = 3 \sin^{-1}\left(\frac{1}{3}\right) + \sin^{-1}\left(\frac{3}{5}\right)$ , then which is greater.

A.  $A=B$

B.  $A < B$

C.  $A > B$

D. none of these

Answer: C



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9. Let  $a$ ,  $b$  and  $c$  be positive real numbers. Then prove that

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

A.  $\pi/4$

B.  $\pi/2$

C.  $\pi$

D. 0

**Answer: C**

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10. If  $\sin^{-1} x + \sin^{-1} y + \sin^{-1} z = \frac{3\pi}{2}$  the value of  $x^{100} + y^{100} + z^{100} - \frac{9}{x^{101} + y^{101} + z^{101}}$  is

A. 0

B. 1

C. 2

D. 3

**Answer: A**

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11. The value of

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

(a)  $(\alpha + \beta)(\alpha^2 + \beta^2)$  (b)  $(\alpha + \beta)(\alpha^2 - \beta^2)$  (c)  $(\alpha + \beta)(\alpha^2 + \beta^2)$  (d) none of these

A.  $(\alpha - \beta)(\alpha^2 - \beta^2)$

B.  $(\alpha + \beta)(\alpha^2 - \beta^2)$

C.  $(\alpha + \beta)(\alpha^2 + \beta^2)$

D. none of these

**Answer: C**



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12. If  $a, b$  are positive quantities and if

$$a_1 = \frac{a+b}{2}, b_1 = \sqrt{ab}, a_2 = \frac{a_1+b_1}{2}, b_2 = \sqrt{a_2b_2} \text{ and so on then}$$

$$\text{A. } a_{\infty} = \frac{\sqrt{b^2 - a^2}}{\cos^{-1}\left(\frac{a}{b}\right)}$$

$$\text{B. } a_{\infty} = \frac{\sqrt{b^2 - a^2}}{\cos^{-1}\left(\frac{a}{b}\right)}$$

$$\text{C. } b_{\infty} = \frac{\sqrt{a^2 + b^2}}{\cos^{-1}\left(\frac{b}{a}\right)}$$

D. none of these

**Answer: B**

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13.  $\tan \frac{2\pi}{5} - \tan \frac{\pi}{15} - \sqrt{3} \tan \frac{2\pi}{5} \tan \frac{\pi}{15}$  is equal to

A.  $-\sqrt{3}$

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

C. 1

D.  $\sqrt{3}$

**Answer: D**

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14. If  $a_1, a_2, a_3, \dots, a_n$  is a.p with common difference  $d$  then

$$\tan \left\{ \tan^{-1} \left( \frac{d}{1 + a_1 a_2} \right) + \tan^{-1} \left( \frac{d}{1 + a_2 a_3} \right) + \dots + \tan^{-1} \left( \frac{d}{1 + a_{n-1} a_n} \right) \right\}$$

is equal to

A.  $\frac{(n-1)d}{a_1 + a_n}$

B.  $\frac{(n-1)d}{1 + a_1 a_n}$

C.  $\frac{nd}{1 + a_1 a_n}$

D.  $\frac{a_n - a_1}{a_n + a_1}$

**Answer: B**

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15. If  $x = \sin(2 \tan^{-1} 2)$ ,  $y = \sin\left(\frac{1}{2} \tan^{-1}\left(\frac{4}{3}\right)\right)$ , then -

A.  $x = y^2$

B.  $y^2 = 1 - x$

C.  $x^2 = \frac{y}{2}$

D.  $y^2 = 1 + x$

**Answer: B**



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**16.** Which of the following angles is greater?

$$\theta_1 = \sin^{-1}\left(\frac{4}{5}\right) + \sin^{-1}\left(\frac{1}{3}\right) \text{ or } \theta_2 = \cos^{-1}\left(\frac{4}{5}\right) + \cos^{-1}\left(\frac{1}{3}\right)$$

A.  $\theta_1 > \theta_2$

B.  $\theta_1 = \theta_2$

C.  $\theta_1 < \theta_2$

D. none of these

**Answer: C**



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17. The value of  $\cos \left[ \frac{1}{2} \cos^{-1} \left\{ \cos \left( \sin^{-1} \left( \frac{\sqrt{63}}{8} \right) \right) \right\} \right]$  is

A.  $\frac{3}{16}$

B.  $\frac{3}{8}$

C.  $\frac{3}{4}$

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

**Answer: C**



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18. Solve  $\tan^{-1}(x + 1) + \tan^{-1}(x - 1) = \tan^{-1} \frac{8}{31}$

A.  $-\frac{1}{4}, 8$

B.  $\frac{1}{4}, -8$

C.  $-4, \frac{1}{8}$

D. 4,  $-\frac{1}{8}$

**Answer: B**



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19.

If

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

then

A.  $\alpha > \beta$

B.  $\alpha = \beta$

C.  $\alpha < \beta$

D.  $\alpha + \beta = 2\pi$

**Answer: C**



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20. The sum of the two angles  $\cot^{-1} 3$  and  $\operatorname{cosec}^{-1} \sqrt{5}$  is

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

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

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

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

**Answer: C**



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

A.  $\frac{3}{7}$

B.  $\frac{7}{8}$

C.  $\frac{8}{21}$

D. none of these

**Answer: D**

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22. Number of integral solutions of the equation

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

A. 0

B. 1

C. 2

D. infinite

**Answer: B**

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23.  $\cos \left\{ \cos^{-1} \left( -\frac{1}{7} \right) + \sin^{-1} \left( -\frac{1}{7} \right) \right\} =$

A.  $-\frac{1}{3}$

B. None of These

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

D.  $\frac{4}{9}$

**Answer: B**



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24. If  $\cos^{-1} x + \cos^{-1} y + \cos^{-1} z = 3\pi$ , then  $xy + yz + zx$  is equal to

A. 1

B. 0

C. -3

D. 3

**Answer: D**



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25.  $\sin \left[ \frac{1}{2} \cos^{-1} \frac{4}{5} \right]$

A.  $-\frac{1}{\sqrt{10}}$

B.  $\frac{1}{\sqrt{10}}$

C.  $-\frac{1}{10}$

D.  $\frac{1}{10}$

**Answer: B**



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26. If  $x \geq 0$  and  $\theta = \sin^{-1} x + \cos^{-1} x - \tan^{-1} x$ , then

A.  $\frac{\pi}{2} < \theta \leq \frac{3\pi}{4}$

B.  $0 \leq \theta \leq \frac{\pi}{4}$

C.  $-\frac{\pi}{4} \leq \theta \leq 0$

$$D. \frac{\pi}{4} \leq \theta \leq \frac{\pi}{2}$$

**Answer: D**

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27. If  $\tan^{-1} a + \tan^{-1} b + \tan^{-1} c = \pi$  then prove that  
 $a + b + c = abc$

A.  $a+b+c=abc$

B.  $ab+bc+ca=abc$

C.  $\frac{1}{a} + \frac{1}{b} + \frac{1}{c} - \frac{1}{abc} = 0$

D.  $ab + bc + ca = a + b + c$

**Answer: A**

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

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

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

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

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

**Answer: C**



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29. Prove the following :  $\frac{\sin^{-1} 4}{5} + 2 \frac{\tan^{-1} 1}{3} = \frac{\pi}{2}$

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

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

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

D. 0



**Answer: C**



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30. The equation  $\sin^{-1} x - \cos^{-1} x = \cos^{-1} \left( \frac{\sqrt{3}}{2} \right)$  has

- A. no solution
- B. unique solution
- C. infinite number of solution
- D. none of these

**Answer: B**



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