MATHS

BOOKS - ARIHANT MATHS (HINGLISH)

INVERSE TRIGONOMETRIC FUNCTIONS

Examples

1. Find the value of

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

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

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

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

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

Answer: C

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2. Find the value of

$$\cos\left[\cos^{-1}\left(\frac{-\sqrt{3}}{2}\right)+\frac{\pi}{6}\right]$$

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

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

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

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

D. $\Rightarrow x \in [-2, 0]$

Answer: A

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

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5. Evaluate the following $(i)\sin^{-1}(\sin 7)$ $(ii)\sin^{-1}(\sin(-5))$

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6. Find the value of $\cos ec\left\{\cot\left(\cot^{-1}.\frac{3\pi}{4}\right)\right\}$

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7.

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

A. 15

B. 10

C. -15

D. -10

Answer: A

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8. Find the value of $\cos^{-1}\{\sin(-5)\}$

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9. Evaluate the following

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

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10. Evaluate the following

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

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

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11. Evaluate the following

$(i)\sin\left(\cos ec^{-1}\frac{5}{3}\right)$ $(ii)\cot\left(\tan^{-1}.\ \frac{3}{4}\right)$

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12. Find the value of $\tan\left\{\cot^{-1}\left(\frac{-2}{3}\right)\right\}$

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

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

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

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

Answer: D

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13. Find the value of

$\sin\left(2\cos^{-1}x+\sin^{-1}x\right)$ when $x=\frac{1}{5}$

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14. Solve $\sin^{-1}x-\cos^{-1}x=\cos^{-1}.\frac{\sqrt{3}}{2}.$

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15. Prove that

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

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16. Prove that

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

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17. Prove that

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

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18. Prove that

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

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19. 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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20. 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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21. Show that $\left(\tan^{-1}1+\tan^{-1}2+\tan^{-1}3\right)=\pi$

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22. Solve for x , $\tan^{-1}(x+1)+\tan^{-1}x+\tan^{-1}(x-1)=\tan^{-1}3x$

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23. The value of $\sum_{m=1}^{\infty}\tan^{-1}\left(\frac{2m}{m^4+m^2+2}\right)$ is

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

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

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

D. None of these

Answer: A

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24. If two angles of a triangle are $\tan^{-1}(2) and tan^{-1}(3)$, then find the third angle.

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25. Solve the following equations

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

(ii) $\tan^{-1} 2 \times \tan^{-1} 3x = \frac{\pi}{4}$

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26. 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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27. If $\cos^{-1}\lambda\cos^{-1}\mu+\cos^{-1}\gamma=3\pi$, then find the value of $\lambda\mu+\mu\lambda$.

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28. If $\Sigma_{i=1}^{2n}\cos^{-1}x_i=0$,then find the value of $\Sigma_{i=1}^{2n}x_i$

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29. If $\Sigma_{i=1}^{2n}\sin^{-1}x_i=n\pi$, then find the value of $\Sigma_{i=1}^{2n}x_i$.

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30. If

$\sin^{-1}x+\sin^{-1}y+\sin^{-1}z=\frac{3\pi}{2}$,then find the value of $\Sigma\frac{\left(x^{101}+y^{101}\right)(}{\left(x^{303}+y^{303}\right)(}$

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31. If

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

.

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32. The sum of the infinte series

$\sin^{-1}\left(\frac{1}{\sqrt{2}}\right)+\sin^{-1}\left(\frac{\sqrt{2}-1}{\sqrt{6}}\right)+\ldots.\sin^{-1}\left(\frac{\sqrt{n}-\sqrt{n-1}}{\sqrt{n(n+1)}}\right)$

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33. Evaluate the following :

$$\sin^2\left[\tan^{-1}.\ \frac{3}{4}\right]$$

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

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35. Find the value of

$$\cos\left(2\cos^{-1}x + \sin^{-1}x\right) \quad \text{when} \quad x = \frac{1}{5}$$

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36. 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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37. Draw the graph of $f(x) = 4x^3 - 3x$ and hence draw the graph of $g(x) = \cos^{-1}(4x^3 - 3x)$.

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38. Prove that

$$4\tan^{-1}.\frac{1}{5} - \tan^{-1}.\frac{1}{70} + \tan^{-1}.\frac{1}{99} = \frac{\pi}{4}$$

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39. If

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

.

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

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41. Find the value of

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

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42. Let $f(x)=\sin x+\cos x+\tan x+\sin^{-1}x+\cos^{-1}x+\tan^{-1}x\cdot$

Then find the maximum and minimum values of $f(x)\cdot$

A. $\frac{\pi}{2}+\cos 1$

B. $\frac{\pi}{2}+\sin 1$

C. $\frac{\pi}{4}+\tan 1+\cos 1$

D. $\frac{\pi}{4}+\tan 1+\sin 1$

Answer: A

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43. The value of $5 \cdot \cot\left(\Sigma_{k=1}^{5} \cot^{-1}\left(k^2 + k + 1\right)\right)$ is equal to

A. $\frac{5}{2}$

B. 7

C. -7

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

Answer: B

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44. If the equation $5\,\text{arctan}\left(x^2 + x + k\right) + 3arc\cot\left(x^2 + x + k\right) = 2\pi,$ has two distinct solutions,then the range of $k,$ is

A. $\left(0, \frac{5}{4}\right]$

B. $\left(-\infty, \frac{5}{4}\right)$

C. $\left(\frac{5}{4}, \infty\right)$

D. $\left(-\infty, \frac{5}{4}\right]$

Answer: B

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45. If $f(x) = x^{11} + x^9 - x^7 + x^3 + 1$ and $f\left(\sin^{-1}(\sin 8)\right) = \alpha, \alpha$ is constant, then $f\left(\tan^{-1}(\tan 8)\right)$ is equal to α (b) $2 - \alpha$ (c) $\alpha - 2$ (d) $\alpha + 2$

A. α

B. $\alpha - 2$

C. $\alpha + 2$

D. $2 - \alpha$

Answer: D

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46. The number of values of x for which $\sin^{-1}\left(x^2 - \frac{x^4}{3} + \frac{x^6}{9}\right) + \cos^{-1}\left(x^4 - \left(\frac{x^8}{3} + \frac{x^{12}}{9}..\right)\right) = \frac{\pi}{2}$, where `0lt=|x|

A. 1

B. 2

C. 3

D. 4

Answer: C

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47. Suppose

$3\sin^{-1}(\log_2 x)+\cos^{-1}(\log_2 y)=\pi/2$ and $\sin^{-1}(\log_2 x)+2\cos^{-1}(\log_2$

, then the value of $\frac{1}{x^{-2}}+\frac{1}{y^{-2}}$ equals

A. 6

B. 7

C. 5

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

Answer: A

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48. Range of $f(x)=\sin^{-1}\log[x]+\log\left(\sin^{-1}[x]\right)$, where [] denotes GIF is

A. 1

B. 2

C. 0

D. $\left\{\log. \frac{\Pi}{2}\right\}$

Answer: D

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49. $\Sigma_{n=1}^{5} \sin^{-1}(\sin(2n-1))$ is

A. 1

B. 2

C. 3

D. 4

Answer: A

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50. If α and $\beta(\alpha > \beta)$ are roots of the equation $x^2 - \sqrt{2}x + \sqrt{3 - 2\sqrt{2}} = 0$, then the value of $(\cos^{-1}\alpha + \tan^{-1}\alpha + \tan$

is equal to

A. $\frac{3\pi}{8}$

B. $\frac{5\pi}{8}$

C. $\frac{7\pi}{8}$

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

Answer: A

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51. If the mapping $f(x) = mx + c, m > 0$ maps $[-1, 1]$ onto $[0, 2]$, then $\tan\left(\tan^{-1}.\frac{1}{7} + \cot^{-1}8 + \cot^{-1}18\right)$ is equal to

A. $f\left(\frac{2}{3}\right)$

B. $f\left(\frac{1}{3}\right)$

C. $f\left(\frac{-1}{3}\right)$

D. $f\left(\frac{-2}{3}\right)$

Answer: D

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52. If

$\left(\sin^{-1}a\right)^2 + \left(\cos^{-1}b\right)^2 + \left(\sec^{-1}c\right)^2 + \left(\cos ec^{-1}d\right)^2 = \frac{5\pi^2}{2}$, then the va

A. $-\pi^2$

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

C. 0

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

Answer: C

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53. If

$f(x) = \Sigma_{r=1}^{n} \tan^{-1}\left(\frac{1}{x^2 + (2r-1)x + (r^2 - r + 1)}\right)$, then $\left| \lim_{n \to \infty} f'(0 \right.$

is

A. 1

B. 2

C. 3

D. 4

Answer: A

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54. The range of the function

$f(x) = \sec^{-1}(x) + \tan^{-1}(x)$,is

A. $(0, \pi)$

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

C. $\left(0, \frac{3\pi}{4}\right]$

D. None of these

Answer: A

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55. The solution set of inequality $(\cot^{-1}x)(\tan^{-1}x) + \left(2 - \frac{\pi}{2}\right)\cot^{-1}x - 3\tan^{-1}x - 3\left(2 - \frac{\pi}{2}\right) > 0$, is

A. $x \in (\tan 2, \tan 3)$

B. $x \in (\cot 3, \cot 2)$

C. $x \in (-\infty, \tan 2) \cup (\tan 3, \infty)$

D. $x \in (-\infty, \cot 3) \cup (\cot 2, \infty)$

Answer: B

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56. Let $f(x) = \sin(\sin^{-1} 2x) + \cos ec(\cos ec^{-1} 2x) + \tan(\tan^{-1} 2x)$, then which one of the following statements is/are incorrect ?

A. f(x) is odd function

B. f(x) is injective

C. Range of f (x) contains only two integers.

D. The value of $f'\left(\frac{1}{2}\right)$ is equal to 6.

Answer: D

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57. If $f(x) = \cos^{-1}(\cos(x+1))$ and $g(x) = \sin^{-1}(\sin(x+2))$, then

A. $f(1) + g(1) = (\pi - 1)$

B. $f(1) > g(1)$

C. $f(2) > g(2)$

D. $f(2) < g(2)$

Answer: A::B::C

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58. $\Sigma_{r=1}^{\infty} \tan^{-1}\left(\frac{2}{(r+2)}\right)$ is

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

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

C. $\frac{7\pi}{4}$

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

Answer: A::B

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59. If sides AB, BC and CA of a triangle ABC are represented by $x+2=0, 3x+y=0$ and $x=3y+2=0$ respectively , then identify the correct statement.

A. $\Sigma \tan A=\frac{4}{3}$

B. $II \tan A=-\frac{4}{3}$

C. $\Sigma \tan A \tan B=-\frac{41}{9}$

D. $\sin^2(A+B)+\cos^2 C=\frac{5}{4}$

Answer: B::C

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60. Which of the following is / are correct ?

A.

$$\cos\left(\cos\left(\cos^{-1} 1\right)\right)<\sin\left(\sin^{-1}(\sin(\pi-1))\right)<\sin\left(\cos^{-1}(\cos(2\pi-

B.

$$\cos\left(\cos\left(\cos^{-1} 1\right)\right) < \sin\left(\cos^{-1}(\cos(2\pi - 2))\right) < \sin\left(\sin^{-1}(\sin(\pi -\right.$$

C.

$$\sum_{t=1}^{5000} \cos^{-1}(\cos(2t\pi - 1)) = \sum_{t=1}^{2500} \cot^{-1}(\cot(t\pi + 2)) \quad \text{, where} \quad t \in I$$

D.

$$\cot^{-1} \cot \cos ec^{-1} \cos ec \sec^{-1} \sec \tan \tan^{-1} \cos \cos^{-1} \sin^{-1} \sin 4 = 4$$

Answer: A::B::C::D

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61. Let x_1 and $x_2 (x_1 > x_2)$ be roots of the equation $\sin^{-1}\left(\cos\left(\tan^{-1}\left(\cos ec\left(\cot^{-1} x\right)\right)\right)\right) = \frac{\pi}{6}$, then

A. $\sin^{-1}. \frac{1}{x^1} + \cos^{-1}. \frac{1}{x_2} = \pi$

B. $\sin^{-1}\left(\frac{1}{x_1}\right) + \cos^{-1}\left(\frac{1}{x_2}\right) = 0$

C. $\sin^{-1}. \frac{1}{x_1} + \sin^{-1}\left(\frac{1}{x_2}\right) = 0$

D. $\cos^{-1}\left(\frac{1}{x_1}\right)+\cos^{-1}\left(\frac{1}{x_2}\right)=\pi$

Answer: A::C::D

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62. Suppose f, g and h be three real valued function defined on R Let $f(x)=2x+|x|\ g(x)=\frac{1}{3}(2x-|x|)\ h(x)=f(g(x))$ The range of the function $k(x)=1+\frac{1}{\pi}\left(\cos^{-1}h(x)+\cot^{-1}(h(x))\right)$ is equal to

A. $\left[\frac{1}{4},\frac{7}{4}\right]$

B. $\left[\frac{5}{4},\frac{11}{4}\right]$

C. $\left[\frac{1}{4},\frac{5}{4}\right]$

D. $\left[\frac{7}{4},\frac{11}{4}\right]$

Answer: B

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63. Suppose f, g, and h be three real valued function defined on R.

Let $f(x)=2x+|x|$, $g(x)=\frac{1}{3}(2x-|x|)$ and $h(x)=f(g(x))$

The domain of definition of the function $l(x)=\sin^{-1}(f(x)-g(x))$ is equal to

A. $\left(\frac{3}{8},\infty\right]$

B. $(-\infty,1]$

C. $[-1,1]$

D. $\left(-\infty,\frac{3}{8}\right]$

Answer: D

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64. In ΔABC, if $\angle B=\sec^{-1}\left(\frac{5}{4}\right)+\cos ec^{-1}\sqrt{5}$,

$\angle C=\cos ec^{-1}\left(\frac{25}{7}\right)+\cot^{-1}\left(\frac{9}{13}\right)$ and c = 3

$\tan A$, $\tan B$, $\tan C$ are in

A. AP

B. GP

C. HP

D. neither AP, GP nor HP

Answer: A

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65. In ΔABC, if $\angle B = \sec^{-1}\left(\frac{5}{4}\right) + \cos ec^{-1}\sqrt{5}$,

$\angle C = \cos ec^{-1}\left(\frac{25}{7}\right) + \cot^{-1}\left(\frac{9}{13}\right)$ and c = 3

The distance between orthocentre and centroid of triangle with sides $a^2, b^{\frac{4}{3}}$ and c is equal to

A. $\frac{5}{2}$

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

C. $\frac{10}{3}$

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

Answer: B

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66. Let $f(x) = x^2 - 2ax + a - 2$ and $g(x) = \left[2 + \dfrac{\sin^{-1}(2x)}{1 + x^2}\right]$. If

the set of real values of $(10k_1 - 3k_2)$.

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67. Let x_1, x_2, x_3 be the solution of

$\tan^{-1}\left(\dfrac{2x+1}{x+1}\right) + \tan^{-1}\left(\dfrac{2x-1}{x-1}\right) = 2\tan^{-1}(x+1)$ where $x_1 < x_2$

is equal to

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68. If the range of function

$f(x) = \left(\pi\sqrt{2} + \cos^{-1}\alpha\right)x^2 + 2\left(\cos^{-1}\beta\right)x + \pi\sqrt{2} - \cos^{-1}\alpha$ is $[0, \infty)$

then find the value of $|\alpha-\beta|+2\alpha\beta+1$.

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69. Consider $f(x)=\sin^{-1}[2x]+\cos^{-1}([x]-1)$ (where $[.]$ denotes greatest integer function .) If domain of $f(x)$ is $[a, b)$ and the range of $f(x)$ is $\{c, d\}$ then $a+b+\frac{2d}{c}$ is equal to (where $c<d$)

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70. Let $f(x)=\min\left(\tan^{-1}x, \cot^{-1}x\right)$ and $h(x)=f(x+2)-\pi/3$. Let x_1, x be the integers in the range of h (x) , then the value of $\left(\cos^{-1}(\cos x_1)+\sin^{-1}(\sin x_2)\right)$ is equal to

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71. If the area enclosed by the curves $f(x) = \cos^{-1}(\cos x)$ and $g(x) = \sin^{-1}(\cos x)$ in $x \in [9\pi/4, 15\pi/4]$ is

(where a and b are coprime), then the value of b is ____

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72. Consider the curve $y = \tan^{-1} x$ and a point $A\left(1, \frac{\pi}{4}\right)$ on it. If the variable point $P_i(x_i, y_i)$ moves on the curve for $i = 1, 2, 3, \ldots N(n \in N)$ such that $y_r = \Sigma_{m=1}^{r} \tan^{-1}\left(\frac{1}{2m^2}\right)$ and B (x,y) be the limiting position of variable point P_n as $n \to \infty$, then the value of reciprocal of the slope of AB will be

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73. If $\tan^{-1} x + \tan^{-1}. \frac{\sqrt{1-y^2}}{y} = \frac{\pi}{3}$ and $\sin^{-1} y - \cos^{-1}\left(\frac{x}{\sqrt{1+x^2}}\right) =$

is

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74. If

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

where $a, b, c, d \in N$ are in their lowest form , find $(b - a - c - d)$

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75. Statement I If α, β are roots of $6x^2 + 11x + 3 = 0$, then $\cos^{-1}\alpha$ exists but not $\cot^{-1}\beta(\alpha > \beta)$.

Statement II Domain of $\cos^{-1}x$ is $[-1, 1]$.

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76. Statement I If $\tan^{-1}x + \tan^{-1}y = \frac{\pi}{4} - \tan^{-1}z$ and $x + y + z = 1$, then arithmetic mean of odd powers of x, y, z is equal to 1/3 .

Statement II For any x, y, z we have

$$xyz - xy - yz - zx + x + y + z = 1 + (x-1)(y-1)(z-1)$$

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77. Match the principal values of $\cos^{-1}(8x^4 - 8x^2 + 1)$ given in column I with the corresponding intervals of x given in column II . For which it holds .

	Column I		Column II
A	$4\cos^{-1}x$	$p.$	$0 \leq x \leq \frac{1}{\sqrt{2}}$
B	$4\cos^{-1}x - 2\pi$	$q.$	$\frac{1}{\sqrt{2}} \leq x \leq 1$
C	$2\pi - 4\cos^{-1}x$	$r.$	$-1 \leq x \leq -\frac{1}{\sqrt{2}}$
D	$4\pi - 4\cos^{-1}x$	$s.$	$-\frac{1}{\sqrt{2}} \leq x \leq 0$

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78. 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 ?

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

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80. If $\left[\sin^{-1}\left(\cos^{-1}\left(\sin^{-1}\left(\tan^{-1}x\right)\right)\right)\right]=1$, where $[\cdot]$ denotes the greatest integer function, then $x\in$

A. $[\tan\sin\cos 1, \tan\sin\cos\sin 1]$

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

C. $[-1, 1]$

D. $[\sin\cos\tan 1, \sin\cos\sin\tan 1]$

Answer: A

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81. If `tan^(-1)y=4tan^(-1)x(|x|

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82. If x_1, x_2, x_3, x_4 are the roots of the equation $x^4 - x^3 \sin 2\beta + x^2 . \cos 2\beta - x \cos \beta - \sin \beta = 0,$ then $\tan^{-1} x_1 + \tan^{-1} x_2 + \tan^{-1} x_3 + \tan^{-1} x_4$ is equal to

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

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85. If $\cot^{-1}\left(\frac{n^2 - 10n + 21.6}{\pi}\right) > \frac{\pi}{6}$, where $xy < 0$ then the possible values of z is (are) 3 (b) 2 (c) 4 (d) 8

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

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87. Find the greatest and least value of $(\sin^{-1}x)^3 + (\cos^{-1}x)^3$.

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88. If

x_r is given by , $x_{r+1} = \sqrt{\frac{1}{2}(1 + x_r)}$. Then, show: $\cos^{-1}x_0 = \frac{\sqrt{1 -}}{x_1 x_2}$

......up to infinity .

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89. Express: $\cot^{-1}\left(\frac{y}{(1-x^2-y^2)}=2\tan^{-1}\sqrt{\frac{3-4x^2}{4x^2}}-\frac{\tan^{-1}\sqrt{3-4x^2}}{x^2}\right.$ as a rational integral equation in x and y.

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

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91. 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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92. 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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93. 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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94. Obtain the integral values of p for which the following system of equations possesses real solutions :

$$\cos^{-1}x+(\sin^{-1}y)^2=\frac{p\pi^2}{4} \text{ and } (\cos^{-1}x)(\sin^{-1}x)(\sin^{-1}y)^2=\frac{\pi^4}{16}$$

Also ,find these solutions.

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95. Solve the equations $2\left(\sin^{-1}x\right)^2 - \left(\sin^{-1}x\right) - 6 = 0$

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96. Solve the equation : $2\tan^{-1}(2x-1) = \cos^{-1}x.$

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Exercise For Session 1

1. Find the value of the following

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

A. $-1/2$

B. 1

C. $1/2$

D. $1/4$

Answer: C

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2. Find the value of the following

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

A. 1

B. -2

C. 0

D. -1

Answer: D

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3. Find the domain of the following

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

A. $(-\infty, -3] \cup [-2, -1] \cup [0, \infty)$

B. $(-\infty, -3] \cup [-2, -1]$

C. $(-\infty, -3] \cup [0, \infty)$

D. None of these

Answer: A

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4. Find the domain of the following $y = \cos^{-1}\left(\frac{x^2}{1+x^2}\right)$

A. `[-1,1]

B. R

C. $[0, 1]$

D. $[-1, 5]$

Answer: B

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5. Find the domain of the following $y = \tan^{-1}\left(\sqrt{x^2 - 1}\right)$

A. $(-\infty, -2] \cup [1, \infty)$

B. `(-infty,-1]

C. $(-\infty, -1] \cup [2, \infty)$

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

Answer: D

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Exercise For Session 2

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

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

B. $-\pi$

C. π

D. 0

Answer: C

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

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

B. (2π)

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

D. None of these

Answer: A

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3. Find the value of $\sin^{-1}\left(\cos.\ \frac{33\pi}{5}\right)$.

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

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

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

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

Answer: B

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4. Find the value of $\cos^{-1}(\cos 13)$.

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5. Find $\sin^{-1}(\sin\theta).\ \cos^{-1}(\cos\theta), \tan^{-1}(\tan\theta), \cot^{-1}(\cot\theta)$ for $\theta \in \left(\frac{5\pi}{2}, 3\pi\right)$

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Exercise For Session 3

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

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

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3. Evaluate the following :

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

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4. Evaluate the following :

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

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5. Find the solutions of the equation $\cos(\cos^{-1} x) = \cos ec(\cos ec^{-1} x)$.

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Exercise For Session 4

1. Evaluate the following

$\tan^{-1}\left\{\tan\left(-\frac{7\pi}{8}\right)\right\}$.

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2. Evaluate the following

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

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3. Evaluate the following

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

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4. Evaluate the following

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

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5. Evaluate the following

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

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6. If $\sin^{-1}x = \frac{\pi}{5}$, for some $x \in (-1, 1)$, then find $\cos^{-1}x$.

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7. If $\sec^{-1}x = \cos ec^{-1}y$, then find the value of $\cos^{-1}.\frac{1}{x} + \cos^{-1}.\frac{1}{y}$.

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

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9. Solve the following

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

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10. If $4\sin^{-1}x+\cos^{-1}x=\pi$, then: x=

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Exercise For Session 5

1. Show that $\sin^{-1}.\ \frac{3}{5}+\sin^{-1}.\ \frac{15}{17}=\pi-\sin^{-1}.\ \frac{84}{85}$

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2. Evaluate $\sin^{-1}.\ \frac{4}{5}+\sin^{-1}.\ \frac{5}{13}+\sin^{-1}.\ \frac{16}{65}$

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3. If $\tan^{-1}4+\tan^{-1}5=\cot^{-1}\lambda\ \ ,\text{then find}\quad '\lambda'$

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4. If $x \in \left(0, \frac{\pi}{2}\right)$, then show that

$$\cos^{-1}\left(\frac{7}{2}(1+\cos 2x)+\sqrt{(\sin^2 x - 48\cos^2 x)}\sin x\right) = x - \cos^{-1}(7\cos x$$

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5. Solve the following

$$\sin^{-1}.\frac{1}{5}+\sin^{-1}.\frac{2}{3}=\sin^{-1}x$$

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6. Solve the following

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

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Exercise For Session 6

1. Evaluate the following :

$$\tan\left(\cos ec^{-1}\frac{\sqrt{41}}{4}\right)$$

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2. Evaluate the following :

$$\sec\left(\cot^{-1}.\ \frac{16}{63}\right)$$

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3. Evaluate the following :

$$\sin\left\{\frac{1}{2}\cot^{-1}.\ \left(\frac{-3}{4}\right)\right\}$$

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4. Evaluate the following :

$$\sin\left\{\frac{1}{2}\cot^{-1}.\ \left(\frac{-3}{4}\right)\right\}$$

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5. Show that $\cot\left[\sin^{-1}\sqrt{\frac{13}{17}}\right] = \sin\left[\tan^{-1}.\ \frac{2}{3}\right]$

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Exercise For Session 7

1. Sketch for the curve $y = \sin^{-1}(3x - 4x^3)$

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

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3. Draw the graph of the following

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

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4. Draw the graph of the following

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

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5. Draw the graph of the following

$$y = \tan^{-1}.\ \frac{2x}{1 - x^2}$$

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6. Draw the graph of the following

$$y = \tan^{-1}.\ \frac{2x}{1 - x^2}$$

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7. Draw the graph of the following

$$y = \cos^{-1}. \frac{1 - x^2}{1 + x^2}$$

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Exercise Single Option Correct Type Questions

1. Find $\cot^{-1}\left(\sqrt{\frac{1 - x^2}{1 + x^2}}\right)$ in terms of cos

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

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

C. $\frac{\pi}{3} - \frac{1}{2}\cos^{-1}(x^2)$

D. None of these

Answer: B

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2. The value of $\cos\left(\frac{1}{2}\cos^{-1}\left(\frac{1}{8}\right)\right)$ is equal to

A. $3/4$

B. $-3/4$

C. $1/16$

D. $1/4$

Answer: A

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3. The inequality $\sin^{-1}(\sin 5) > x^2 - 4x$ holds if

A. $x = 2 - \sqrt{9 - 2\pi}$

B. $x = 2 + \sqrt{9 - 2\pi}$

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

D. $x > 2 + \sqrt{9 - 2\pi}$

Answer: C

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4. The value of

$$\sin^{-1}\left\{\left(\sin.\frac{\pi}{3}\right)\frac{x}{\sqrt{(x^2+k^2-kx)}}\right\} - \cos^{-1}\left\{\left(\cos.\frac{\pi}{6}\right)\frac{x}{\sqrt{(x^2+k^2-kx)}}\right.$$

is

A. $\tan^{-1}\left(\frac{2x^2+sk-k^2}{x^2-2xk+k^2}\right)$

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

C. $\tan^{-1}\left(\frac{x^2+2xk-2k^2}{2x^2-2xk+2k^2}\right)$

D. None of the above

Answer: D

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5. If $a \leq \tan^{-1}\left(\frac{1-x}{1+x}\right) \leq b$ where $0 \leq x \leq 1$, then $(a, b) =$

A. $\left(0, \frac{\pi}{4}\right)$

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

C. $\left(-\frac{\pi}{4}, \frac{\pi}{4}\right)$

D. $\left(\frac{\pi}{4}, \frac{\pi}{2}\right)$

Answer: A

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6. Sum of infinite terms of the series $\cot^{-1}\left(1^2+\frac{3}{4}\right)+\cot^{-1}\left(2^2+\frac{3}{4}\right)+\cot^{-1}\left(3^2+\frac{3}{4}\right)+ \ldots$ is

A. $\pi/4$

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

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

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

Answer: B

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7. Solution of equation $\cot^{-1} x + \sin^{-1}. \frac{1}{\sqrt{5}} = \frac{\pi}{4}$ is

A. $x = 3$

B. $x = 1/\sqrt{5}$

C. $x = 0$

D. None of these

Answer: A

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8. Solution set of the inequality

$\left(\cot^{-1} x\right)^2 - \left(5 \cot^{-1} x\right) + 6 > 0$ is

A. $(\cot 3, \cot 2)$

B. $(-\infty, \cot 2) \cup (\cot 2, \infty)$

C. $(\cot 2, \infty)$

D. None of the above

Answer: B

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9. Find the sum to infinite terms of the series $\tan^{-1}\left(\frac{1}{3}\right) + \tan^{-1}\left(\frac{2}{9}\right) + \dots\dots\dots + \tan^{-1}\left(\frac{2^{n-1}}{1 + 2^{2n-1}}\right) + \dots\dots\dots$

A. $\pi / 4$

B. $\pi / 2$

C. π

D. None of these

Answer: A

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10. If $x + \frac{1}{x} = 2$, then principal value of $\sin^{-1} x$ is

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

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

C. π

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

Answer: B

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11. If $x \in \left(-\frac{\pi}{2}, \frac{\pi}{2}\right)$, then the value of $\tan^{-1}\left(\frac{\tan x}{4}\right) + \tan^{-1}\left(\frac{3 \sin 2x}{5 + 3 \cos 2x}\right)$ is

A. $x / 2$

B. $2x$

C. $3x$

D. x

Answer: D

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

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

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

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

D. π

Answer: B

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13. The value of $\frac{\cot^{\pi}}{4} - 2\cot^{-13}$ is

A. 1

B. 7

C. -1

D. None of these

Answer: B

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

A. 1

B. 0

C. -1

D. None of these

Answer: A

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15. If $\cos^{-1}\left(\frac{1-a^2}{1+a^2}\right) - \cos^{-1}\left(\frac{1-b^2}{1+b^2}\right) = 2\tan^{-1}x$, then x is

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

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

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

D. None of these

Answer: A

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

A. $x \in \left[-\frac{1}{\sqrt{3}}, \frac{1}{\sqrt{3}}\right]$

B. $x \in \left(-\frac{1}{\sqrt{3}}, \frac{1}{\sqrt{3}}\right)$

C. $x \in \left[0, \frac{1}{\sqrt{3}}\right]$

D. None of these

Answer: B

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17. The value of

$$\cos^{-1}\left[\cot\left(\sin^{-1}\left(\sqrt{\frac{2-\sqrt{3}}{4}}\right)+\cos^{-1}\left(\frac{\sqrt{12}}{4}\right)+\sec^{-1}\sqrt{2}\right)\right.$$

A. 0

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

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

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

Answer: D

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18. If $\frac{\tan^{-}(x)}{\pi} < \frac{\pi}{3}x \in N$ then the maximum vlaue of x is

A. 2

B. 5

C. 7

D. None of these

Answer: B

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19. 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 is

A. $\cos 2\alpha$

B. $\sin 2\alpha$

C. $\tan 2\alpha$

D. $\cot 2\alpha$

Answer: B

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20. Find the number of positive integral solutions of $\tan^{-1}x + \cot^{-1}y = \tan^{-1}3$.

A. one

B. two

C. three

D. four

Answer: B

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21. If $\cos ec^{-1}(\cos ecx)$ and $\cos ec\left(\cos ec^{-1}x\right)$ are equal functions, then the maximum range of value of x is

A. $\left[-\frac{\pi}{2}, -1\right] \cup \left[1, \frac{\pi}{2}\right]$

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

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

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

Answer: A

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22. The value of $\lim_{|x| \to \infty} \cos\left(\tan^{-1}\left(\sin\left(\tan^{-1} x\right)\right)\right)$ is equal to

A. -1

B. $\sqrt{2}$

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

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

Answer: D

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23. Complete solution set of $(\cot^{-1}x) + 2(\tan^{-1}x) = 0,$ where [] denotes the greatest integer function, is equal to $(0, \cot 1)$ (b) $(0, \tan 1)$ $(\tan 1, \infty)$ (d) $(\cot 1, \tan 1)$

A. $(0, \cot 1)$

B. $(0, \tan 1)$

C. $(\tan 1, \infty)$

D. $(\cot 1, \tan 1)$

Answer: D

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24. If $\sin^{-1}: [-1, 1] \rightarrow \left[\frac{\pi}{2}, \frac{3\pi}{2}\right]$ and $\cos^{-1}: [-1, 1] \rightarrow [0, \pi]$ be two bijective functions, respectively inverse of bijective functions $\sin: \left[\frac{\pi}{2}, \frac{3\pi}{2}\right] \rightarrow [-1, 1]$ and $\cos: [0, \pi] \rightarrow [-1, 1]$ then $\sin^{-1} x + \cos$

is

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

B. π

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

D. not a constant

Answer: D

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25. If $a \sin^{-1} x - b \cos^{-1} x = c$, then $a \sin^{-1} x + b \cos^{-1} x$ is equal to 0 (b) $\frac{\pi ab + c(b-a)}{a+b}$ $\frac{\pi}{2}$ (d) $\frac{\pi ab + c(a-b)}{a+b}$

A. 0

B. $\dfrac{\pi ab + c(b-a)}{a+b}$

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

D. $\dfrac{\pi ab + c(a-b)}{a+b}$

Answer: D

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26. The number of integer x satisfying $\sin^{-1}|x-2| + \cos^{-1}(1-|3-x|) = \dfrac{\pi}{2}$ is 1 (b) 2 (c) 3 (d) 4

A. 1

B. 2

C. 3

D. 4

Answer: B

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27. The value of α such that $\frac{\sin^{-1} 2}{\sqrt{5}}, \frac{\sin^{-1} 3}{\sqrt{10}}, \sin^{-1}\alpha$ are the angles of a triangle is $\frac{-1}{\sqrt{2}}$ (b) $\frac{1}{2}$ (c) $\frac{1}{\sqrt{3}}$ (d) $\frac{1}{\sqrt{2}}$

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

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

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

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

Answer: D

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28.

$Let\left|\tan^{-1} x \tan^{-1} 2x \tan^{-1} 3x \tan^{-1} 3x \tan^{-1} x \tan^{-1} 2x \tan^{-1} 2x \tan^{-1}\right.$

of values of x satisfying the equation is 1 (b) 2 (c) 3 (d) 4

A. 1

B. 2

C. 3

D. 4

Answer: A

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29. If α 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. $-\pi$

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

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

D. π

Answer: A

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30. Let $u = \cot^{-1}\sqrt{\cos 2\theta} - \tan^{-1}\sqrt{\cos 2\theta}$, then the value of $\sin u$ is

A. $\cos 2\theta$

B. $\sin 2\theta$

C. $\tan^2\theta$

D. $\cot^2\theta$

Answer: C

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31. Let

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

function fx) is continuous everywhere but not differentiable at x equals to

A. 1

B. -1

C. 0

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

Answer: C

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32. Let $f(x) = \sin^{-1}\left(\frac{2x}{1+x^2}\right) \forall x \in R.$ The function $f(x)$ is continuous everywhere but not differentiable at x is/ are

A. $0, 1$

B. $-1, 1$

C. $-1, 0$

D. $0, 2$

Answer: B

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33. Let $f(x) = \tan^{-1}(x^2 - 18x + a) > 0 x \in R$. Then the value of a lies in

A. $(81, \infty)$

B. $[81, \infty)$

C. $(-\infty, 81)$

D. $(-\infty, 81]$

Answer: A

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34. Let $f(x) = \sin^{-1} 2x + \cos^{-1} 2x + \sec^{-1} 2x$. Then the sum of the maximum and minimum values of f(x) is

A. π

B. 2π

C. 3π

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

Answer: B

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35. If $\tan^{-1}. \frac{b}{c+a} + \tan^{-1}. \frac{c}{a+b} = \frac{\pi}{4}$ where a, b, c , are the sides of $\Delta ABC, \text{then} \Delta ABC$ is

A. Acute - angled triangle

B. Obtuse - angled triangle

C. Right- angled triangle

D. Equilateral triangle

Answer: C

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36. Solutions of $\sin^{-1}(\sin x) = \sin x$ are if $x \in (0, 2\pi)$

A. 4 real roots

B. 2 positive real roots

C. 2 negative real roots

D. 5 real roots

Answer: D

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37. The equation $\dfrac{e^{\sin^{-1}x}}{\pi} = \dfrac{y}{\log y}$ has

A. Unique solution

B. Infinite many solution

C. $x = 1$

D. $y = e$

Answer: B

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38. Let $f(x) = 1 + 2\sin\left(\frac{e^x}{e^x + 1}\right)$ $x \geq 0$ then $f^{-1}(x)$ is equal to (assuming f is bijectve)

A. $\log\left(\frac{\sin^{-1}\left(\frac{x-1}{2}\right)}{1 - \sin^{-1}\left(\frac{x-1}{2}\right)}\right)$

B. $\log\left(\frac{\sin\left(\frac{x-1}{2}\right)}{1 - \sin\left(\frac{x-1}{2}\right)}\right)$

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

D. $e^{\frac{\sin\left(\frac{x-1}{2}\right)}{1 - \sin\left(\frac{x-1}{2}\right)}}$

Answer: A

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39. $\cos^{-1}\left(\cos\left(2\cot^{-1}\left(\sqrt{2}-1\right)\right)\right)$ is equal to

A. $\sqrt{2}-1$

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

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

D. None of these

Answer: C

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40. The maximum value of $f(x) = \tan^{-1}\left(\frac{\left(\sqrt{12}-2\right)x^2}{x^2+2x^2+3}\right)$ is 818^0(b)

36^0(c)22. 5^0(d)15^0`

A. 18°

B. 36°

C. 22.5°

D. 15°

Answer: D

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41. If $\tan^{-1}. \frac{\sqrt{1+x^2}-1}{x} = 4^{\circ}$, then

A. $x = \tan 2^{\circ}$

B. $x = \tan 4^{\circ}$

C. $x = \tan(1/4)^{\circ}$

D. $x = \tan 8^{\circ}$

Answer: D

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42. If $\tan^{-1}(\sin^2\theta - 2\sin\theta + 3) + \cot^{-1}(5^{\sec} \hat{} (2y) + 1) = \frac{\pi}{2}$, then value of $\cos^2\theta - \sin\theta$ is equal to 0 (b) -1 (c) 1 (d) none of these

A. 0

B. -1

C. 1

D. None of the above

Answer: C

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43. The number of solution of the equation $|\tan^{-1}|x|| = \sqrt{(x^2+1)^2 - 4x^2}$ is

A. 1

B. 2

C. 3

D. 4

Answer: D

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44. For any real number $x \geq 1$, the expression

$\sec^2(\tan^{-1}x) - \tan^2(\sec^{-1}x)$ is equal to

A. 1

B. 2

C. $2x^2$

D. $2\sqrt{2}$

Answer: B

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45. Let $f: R \rightarrow \left[0, \frac{\pi}{2}\right)$ be defined by $f(x) = \tan^{-1}(3x^2 + 6x + a)$. If $f(x)$ is an onto function . then the value of a si

A. 1

B. 2

C. 3

D. 4

Answer: C

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46. The value of expression $\tan^{-1}\left(\frac{\sqrt{2}}{2}\right) + \sin^{-1}\left(\frac{\sqrt{5}}{5}\right) - \cos^{-1}\left(\frac{\sqrt{10}}{10}\right)$

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

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

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

D. $\pi-\cot^{-1}\left(\frac{1-\sqrt{2}}{1+\sqrt{2}}\right)$

Answer: C

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47. The value of $\sec\left(2\cot^{-1}2+\cos^{-1}.\frac{3}{5}\right)$ is equal to

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

B. $-\frac{24}{7}$

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

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

Answer: D

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48. Which one of the following statement is meaningless ?

A. $\cos^{-1}\left(\text{In}\left(\frac{2e+4}{3}\right)\right)$

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

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

D. $\sec^{-1}(\pi)$

Answer: A

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49. The vale of $\sec\left(\sin^{-1}\left(\sin\left(\frac{-50\pi}{9}\right)\right)+\cos^{-1}\left(\frac{\cos(31\pi)}{9}\right)\right)$

A. $\sec.\ \frac{10\pi}{9}$

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

C. 1

D. -1

Answer: B

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50. The number k is such that $\tan\{arc\tan(2) + arc\tan(20k)\} = k$. The sum of all possible values of k is

A. $-\frac{19}{40}$

B. $-\frac{21}{40}$

C. 0

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

Answer: A

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51. The value of $\Sigma_{r=2}^{\infty}\tan^{-1}\left(\frac{1}{r^2-5r+7}\right)$, is

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

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

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

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

Answer: C

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52. If

$$x = \tan^{-1} 1 - \cos^{-1}\left(-\frac{1}{2}\right) + \frac{\sin^{-1} 1}{2}, y = \cos\left(\frac{1}{2}\cos^{-1}\left(\frac{1}{8}\right)\right),$$

then

A. $x = \pi y$

B. $y = \pi x$

C. $\tan x = -(4/3)y$

D. $\tan x = (4/3)y$

Answer: C

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53. Find the value of `tan^(-1)(1/2tan2A)+tan^(-1)(cotA)+tan^(-1)(cot^3A),for0

A. $4\tan^{-1}(1)$

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

C. 0

D. None of these

Answer: A

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54. $\sum_{n=1}^{\infty}\left(\tan^{-1}\left(\frac{4n}{n^4-2n^2+2}\right)\right)$ is equal to (A) $\tan^{-1}(2)+\tan^{-1}(3)$ (B) $4\tan^{-1}(1)$ (C) $\frac{\pi}{2}$ (D) $\sec^{-1}\left(-\sqrt{2}\right)$

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

B. $4\tan^{-1}1$

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

D. $\sec^{-1}(-\sqrt{2})$

Answer: A

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55. Number of solutions (s) of the equations

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

A. 3

B. 2

C. 1

D. 0

Answer: C

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56. There exists a positive real number x satisfying $\cos(\tan^{-1}x) = x$. The number value of $\cos^{-1}\left(\frac{x^2}{2}\right)$ is

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

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

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

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

Answer: C

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57. The range of values of p for which the equation $\sin\cos^{-1}(\cos(\tan^{-1}x)) = p$ has a solution is

A. $\left(-\frac{1}{\sqrt{2}}, \frac{1}{\sqrt{2}}\right]$

B. $[0, 1)$

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

D. $(-1, 1)$

Answer: B

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58. Number of solutions of the equation $\log_{10}\left(\sqrt{5\cos^{-1}x - 1}\right) + \frac{1}{2}\log_{10}\left(2\cos^{-1}x + 3\right) + \log_{10}\sqrt{5} = 1$ is

A. 0

B. 1

C. more than one but finite

D. infinite

Answer: B

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59. Which of the following is the solution set of the equations $\sin^{-1}x = \cos^{-1}x + \sin^{-1}(3x - 2)$?

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

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

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

D. $\left\{\frac{1}{3}, 1\right\}$

Answer: A

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

A. $[-1, 1]$

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

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

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

Answer: C

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61. The solution set of equation $\sin^{-1}\sqrt{1-x^2} + \cos^{-1}x = \cot^{-1}\left(\frac{\sqrt{1-x^2}}{x}\right) - \sin^{-1}x$, is

A. $[-1, 1] - \{0\}$

B. $(0, 1] \cup \{-1\}$

C. $[-1, 0) \cup \{1\}$

D. $[-1, 1]$

Answer: C

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62. The value of the angle $\tan^{-1}(\tan 65^\circ - 2\tan 40^\circ)$ in degrees is equal to

A. -20°

B. 20°

C. 25°

D. 40°

Answer: C

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63. If $\cos^{-1}.\frac{x}{a} - \sin^{-1}.\frac{y}{b} = \theta(a, b, \neq 0)$, then the maximum value of $b^2x^2 + a^2y^2 + 2abxy\sin\theta$ equals

A. ab

B. $(a+b)^2$

C. $2(a+b)^2$

D. a^2b^2

Answer: D

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64. The value of $\Sigma_{r=1}^{\infty}\tan^{-1}\left(\frac{1}{r^2+5r+7}\right)$ is equal to

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

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

C. $\frac{\pi}{2}-\cos^{-1}.\frac{1}{\sqrt{10}}$

D. $\cot^{-1}2$

Answer: C

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65. The range of the function ,

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

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

B. $\{-(\pi/4), 3\pi/4\}$

C. $\{\pi/4, -(3\pi/4)\}$

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

Answer: C

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66. Let $g: R0, \overrightarrow{\frac{\pi}{3}}$ be defined by $g(x) = \cos^{-1}\left(\frac{x^2 - k}{1 + x^2}\right)$. Then find the possible values of k for which g is a subjective function.

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

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

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

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

Answer: C

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67. Number of values of x satisfying simultaneously $\sin^{-1} x = 2\tan^{-1} x$ and $\tan^{-1}\sqrt{x(x-1)} + \cos ec^{-1}\sqrt{1+x-x^2} = \frac{\pi}{2}$, is

A. 0

B. 1

C. 2

D. 3

Answer: C

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68. Number of values of x satisfying the equation $\cos(3arc\cos(x-1))=0$ is equal to

A. 0

B. 1

C. 2

D. 3

Answer: D

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69. Which one of the following function contains only one integer in its range ?

[Note sgn (k) denotes the signum function of k.]

A. $f(x)=\frac{1}{2}\cos^{-1}\left(\frac{1-x^2}{1+x^2}\right)$

B. $g(x) = sgn\left(x + \frac{1}{x}\right)$

C. $h(x) = \sin^2 x + 2\sin x + 2$

D. $k(x) = \cos^{-1}(x^2 - 2x + 2)$

Answer: D

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70. If range of the function $f(x) = \tan^{-1}(3x^2 + bx + 3), x \in R$ is $\left[0, \frac{\pi}{2}\right)$, then square of sum of all possible values of b will be

A. 0

B. 18

C. 72

D. None of these

Answer: A

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Exercise More Than One Correct Option Type Questions

1. Let $\theta = \tan^{-1}\left(\tan. \frac{5\pi}{4}\right)$ and $\phi = \tan^{-1}\left(-\tan. \frac{2\pi}{3}\right)$ then

A. $\theta > \phi$

B. $4\theta - 3\phi = 0$

C. $\theta + \phi = \frac{7\pi}{12}$

D. None of these

Answer: B::C

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2. let $f(x) = e^{\cos^{-1}\sin\left(x + \frac{\pi}{3}\right)}$ then $f\left(\frac{8\pi}{9}\right)$ and $f\left(\frac{-7\pi}{4}\right)$

A. $f\left(\frac{8\pi}{9}\right) = e^{5\pi/18}$

B. $f\left(\frac{8\pi}{9}\right)=e^{13\pi/18}$

C. $f\left(-\frac{7\pi}{4}\right)=e^{\pi/12}$

D. $f\left(-\frac{7\pi}{4}\right)=e^{11\pi/12}$

Answer: B::C

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3. If the numerical value of $\tan\left\{\cos^{-1}\left(\frac{4}{5}\right)+\tan^{-1}\left(\frac{2}{3}\right)\right\}$ is $\frac{a}{b}$ then

A. $a+b=23$

B. $a-b=11$

C. $3b=a+1$

D. $2a=3b$

Answer: A::B::C

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4. Let $f(x) = \sin^{-1}x + \cos^{-1}x$. Then $\frac{\pi}{2}$ is equal to

A. $f\left(-\frac{1}{2}\right)$

B. $f(k^2 - 2k + 3), k \in R$

C. $f\left(\frac{1}{1+k^2}\right), k \in R$

D. $f(-2)$

Answer: A::C

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5. $\cos^{-1}x = \tan^{-1}x$ then

A. $x^2 = \frac{\sqrt{5}-1}{2}$

B. $x^2 = \frac{\sqrt{5}+1}{2}$

C. $\sin(\cos^{-1}x) = \frac{\sqrt{5}-1}{2}$

D. $\tan(\cos^{-1}x) = \frac{\sqrt{5}-1}{2}$

Answer: A::C

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6. The value(s) of x satisfying the equation $\sin^{-1}|\sin x| = \sqrt{\sin^{-1}|\sin x|}$ is /are given by $(n \in l)$

A. $n\pi - 1$

B. $n\pi$

C. $n\pi + 1$

D. $2n\pi + 1$

Answer: A::B::C

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7. If $(\sin^{-1}x + \sin^{-1}w)(\sin^{-1}y + \sin^{-1}z) = \pi^2$, then $D = |x^{N_1}y^{N_3}z^{N_3}w^{N_4}|(N_1, N_2, N_3, N_4 \in N)$ has a maximum value of 2 has a maximum value of 0 16 different D are possible has a minimum value of -2

A. has a maximum value of 2

B. has a minimum value of 0

C. 16 different D are possible

D. has a minimum value of -2

Answer: A::C::D

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8. Indicate the relation which can hold in their respective domain for infinite values of x.

A. $\tan\left|\tan^{-1}x\right| = |x|$

B. $\cot\left|\cot^{-1}x\right| = |x|$

C. $\tan^{-1}|\tan x| = |x|$

D. $\sin|\sin^{-1} x| = |x|$

Answer: A::B::C::D

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9. To the equation $2^2\pi / \cos^{(-1)x} - \left(a + \frac{1}{2}\right)2^{\pi} / \cos^{(-1)x} - a^2 = 0$ has only one real root, then $1 \leq a \leq 3$ (b) $a \geq 1$ $a \leq -3$ (d) $a \geq 3$

A. $1 \leq a \leq 3$

B. $a \geq 1$

C. $a \leq -3$

D. $a \geq 3$

Answer: B::C

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10. $\sin^{-1}(\sin 3) + \sin^{-1}(\sin 4) + \sin^{-1}(\sin 5)$ when simplified reduces to

A. an irrational number

B. a rational number

C. an even prime

D. a negative integer

Answer: B::D

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11. If $\cos^{-1}x + \cos^{-1}y + \cos^{-1}z = \pi$, then

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

B. $2(\sin^{-1}x + \sin^{-1}y + \sin^{-1}z) = \cos^{-1}x + \cos^{-1}y + \cos^{-1}z$

C. $xy + yz + zx = x + y + z - 1$

D. $\left(x + \frac{1}{x}\right) + \left(y + \frac{1}{y}\right) + \left(z + \frac{1}{z}\right) \geq 6$

Answer: A::B

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12. $2\tan\left(\tan^{-1}(x)+\tan^{-1}(x^3)\right)$ where $x \in R-\{-1,1\}$ is equal to

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

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

C. $\tan\left(\cot^{-1}(-x)-\cot^{-1}(x)\right)$

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

Answer: A::B::C

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13. Let $f(x)=\sin^{-1}|\sin x|+\cos^{-1}(\cos x)$. Which of the following statement(s) is / are TRUE ?

A. $f(f(3)) = \pi$

B. f (x) is periodic with fundamental period 2π

C. f (x) is neither even nor odd

D. Range of f(x) is $[0, 2\pi]$

Answer: A::B

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14. If $f(x) = \sin^{-1} x . \cos^{-1} x . \tan^{-1} x . \cot^{-1} x . \sec^{-1} x . \cos ec^{-1} x,$

then which of the following statement (s) hold(s) good?

A. The graph of y = f (x) does not lie above x axis

B. The non - negative difference between maximum minimum value of the function $y = f(x)$ is $\frac{3\pi^6}{64}$

C. The function y = f (x) is not injective.

D. Number of non-negative integers in the domain of f (x) is two .

Answer: A::B

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15. Let

$$\alpha = 3\cos^{-1}\left(\frac{5}{\sqrt{28}}\right) + 3\tan^{-1}\left(\frac{\sqrt{3}}{2}\right) \text{ and } \beta = 4\sin^{-1}\left(\frac{7\sqrt{2}}{10}\right) - 4\tan$$

, then which of the following does not hold (s) good ?

A. $\alpha < \pi \text{ but } \beta > \pi$

B. $\alpha > \pi \text{ but } \beta < \pi$

C. Both $\alpha \text{ and } \beta$ are equal

D. $\cos(\alpha + \beta) = 0$

Answer: A::B::D

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16. Let function f(x) be defined as

$f(x) = \left|\sin^{-1} x\right| + \cos^{-1}\left(\frac{1}{x}\right)$. Then which of the following is /are TRUE.

A. f(x) is injective in its domain.

B. f(x) is many - one in its domain.

C. Range of f is singleton set

D. sgn (f(x)) =1 , where sgn x denotes signum function of x.

Answer: A::D

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17. Which of the following pairs of function are identical?

A. $f(x) = \sin\left(\tan^{-1} x\right), g(x) = \frac{x}{\sqrt{1+x^2}}$

B. $f(x) = sgn\left(\cot^{-1} x\right), g(x) = \sec^2 x - \tan^2 x$,where sgn x denotes signum function of x.

C. $f(x) = e^{\text{In}\left(\cos^{-1}\left(\frac{x^2-1}{x^2+1}\right)\right)}, g(x) = \cos^{-1}\left(\frac{x^2-1}{x^2+1}\right)$

D. $f(x) = \sin^{-1}\left(\frac{2x}{1+x^2}\right), g(x) = 2\tan^{-1}x$

Answer: A::C

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18. The value of $\Sigma_{n=1}^{\infty}\cot^{-1}\left(n^2+n+1\right)$ is also equal to

A. $\cot^{-1}(-1)+\sec^{-1}(1)-\cos ec^{-1}(1)$

B. $\cot^{-1}(2)+\cot^{-1}(3)$

C. minimum value of the function $f(x) = \tan^{-1}\left(\frac{1-x^2}{1+x^2}\right)$

D. $\cos^{-1}\left(\cos 41\frac{\pi}{4}\right)$

Answer: A::B::D

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19. Let $f : I - \{-1, 0, 1\} \to [-\pi, \pi]$ be defined as $f(x) = 2\tan^{-1}x - \tan^{-1}\left(\frac{2x}{1-x^2}\right)$, then which of the following statements (s) is (are) correct ?

A. f(x) is bijective

B. f(x) is injective but not surjective

C. f(x) is neither injective nor surjective

D. f(x) is an odd function

Answer: C::D

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20. If $\log x = \frac{-1}{3}\log y = \frac{2}{5}$ and $P = \log\left(\sin\left(arc\cos\sqrt{1-x^2}\right)\right)$ $Q = \log\left(\cos\left(arc\frac{\tan\sqrt{1-x^2y^2}}{xy}\right)\right)$, then

A. $P = \frac{-1}{9}$

B. $P + Q = \frac{-4}{15}$

C. $P - Q = \frac{-2}{5}$

D. $\frac{P}{Q} = -5$

Answer: B::C::D

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Exercise Statement I And Ii Type Questions

1. Let S denotes the set consisting of four functions and $S = \{[x], \sin^{-1}x, |x|, \{x\}\}$ where , $\{x\}$ denotes fractional part and [x] denotes greatest integer function , Let A, B , C are subsets of S.

Suppose

A : consists of odd functions (s)

B : consists of discontinuous function (s)

and C: consists of non-decreasing function(s) or increasing function (s).

If $f(x) \in A \cap C, g(x) \in B \cap C, h(x) \in B$ but not C and $l(x) \in$ neither A nor B nor C .

Then, answer the following.

The function I (x) is

A. periodic

B. even

C. odd

D. neither odd nor even

Answer: B

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2. Let S denotes the set consisting of four functions and $S = \{[x], \sin^{-1} x, |x|, \{x\}\}$ where , $\{x\}$ denotes fractional part and [x] denotes greatest integer function , Let A, B , C are subsets of S.

Suppose

A : consists of odd functions (s)

B : consists of discontinuous function (s)

and C: consists of non-decreasing function(s) or increasing function (s).

If $f(x) \in A \cap C, g(x) \in B \cap C, h(x) \in B$ but not C and $l(x) \in$ neither A nor B nor C .

Then, answer the following.

The range of g(f(x)) i

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

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

C. $\{0, 1\}$

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

Answer: D

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3. Let S denotes the set consisting of four functions and $S = \{[x], \sin^{-1} x, |x|, \{x\}\}$ where , $\{x\}$ denotes fractional part and [x] denotes greatest integer function , Let A, B , C are subsets of S.

Suppose

A : consists of odd functions (s)

B : consists of discontinuous function (s)

and C: consists of non-decreasing function(s) or increasing function (s).

If $f(x) \in A \cap C, g(x) \in B \cap C, h(x) \in B$ but not C and $l(x) \in$ neither A nor B nor C .

Then, answer the following.

The range of $f(h(x))$ is

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

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

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

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

Answer: B

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4. Let f be a real - valued function defined on R (the set of real numbers)

such that $f(x) = \sin^{-1}(\sin x) + \cos^{-1}(\cos x)$

The value of f(10) is equal to

A. $6\pi - 20$

B. $7\pi - 20$

C. $20 - 7\pi$

D. $20 - 6\pi$

Answer: B

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5. Let f be a real - valued function defined on R (the set of real numbers) such that $f(x) = \sin^{-1}(\sin x) + \cos^{-1}(\cos x)$

The area bounded by curve $y = f(x)$ and x- axis from $\frac{\pi}{2} \leq x \leq \pi$ is equal to

A. $\frac{\pi^2}{4}$

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

C. π^2

D. $\frac{\pi^2}{8}$

Answer: B

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6. Let f be a real - valued function defined on R (the set of real numbers)

such that $f(x) = \sin^{-1}(\sin x) + \cos^{-1}(\cos x)$

Number of values of x in interval (0, 3) so that f(x) is an integer, is equal to

A. 1

B. 2

C. 3

D. 0

Answer: C

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7. Consider a real-valued function $f(x) = \sqrt{\sin^{-1} x + 2} + \sqrt{1 - \sin^{-1} x}$ then The domain of definition of $f(x)$ is

A. $[-1, 1]$

B. $[\sin 1, 1]$

C. $[-1, \sin 1]$

D. $[-1, 0]$

Answer: C

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8. Consider a real - valued function

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

The range of f (x) is

A. $[0, \sqrt{3}]$

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

C. $[1, \sqrt{6}]$

D. $[\sqrt{3}, \sqrt{6}]$

Answer: D

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9. Given that ,

$$\tan^{-1}\left(\frac{2x}{1-x^2}\right) = \begin{cases} 2\tan^{-1}x, |x| \le 1 \\ -\pi + 2\tan^{-1}x, x > 1 \\ \pi + 2\tan^{-1}x, x < -1 \end{cases}$$

$$\sin^{-1}\left(\frac{2x}{1+x^2}\right) = \begin{cases} 2\tan^{-1}x, |x| \le 1 \\ \pi - 2\tan^{-1}x, x > 1 \text{ and} \\ -\left(\pi + 2\tan^{-1}\right), x < -1 \end{cases}$$

$$\sin^{-1}x + \cos^{-1}x = \pi/2 \quad \text{for} \quad -1 \le x \le 1$$

$\sin^{-1}\left(\frac{4x}{x^2+4}\right) + 2\tan^{-1}\left(-\frac{x}{2}\right)$ is independent of x, then

A. $x \in [-3, 4]$

B. $x \in [-2, 2]$

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

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

Answer: B

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10. Given that ,

$$\tan^{-1}\left(\frac{2x}{1-x^2}\right) = \begin{cases} 2\tan^{-1}x, |x| \le 1 \\ -\pi + 2\tan^{-1}x, x > 1 \\ \pi + 2\tan^{-1}x, x < -1 \end{cases}$$

$$\sin^{-1}\left(\frac{2x}{1+x^2}\right) = \begin{cases} 2\tan^{-1}x, |x| \le 1 \\ \pi - 2\tan^{-1}x, x > 1 \text{ and} \\ -\left(\pi + 2\tan^{-1}\right), x < -1 \end{cases}$$

$$\sin^{-1}x + \cos^{-1}x = \pi/2 \text{ for } -1 \le x \le 1$$

If $\cos^{-1}.\ \frac{6x}{1+9x^2} = -\frac{\pi}{2} + 2\tan^{-1}3x$, then $x \in$

A. $\left(\frac{1}{3}, \infty\right)$

B. $(-1, \infty)$

C. $(-\infty, m-1)$

D. None of these

Answer: A

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11. Given that ,

$$\tan^{-1}\left(\frac{2x}{1-x^2}\right)=\begin{cases}2\tan^{-1}x, |x|\le 1\\ -\pi+2\tan^{-1}x, x>1\\ \pi+2\tan^{-1}x, x<-1\end{cases}$$

$$\sin^{-1}\left(\frac{2x}{1+x^2}\right)=\begin{cases}2\tan^{-1}x, |x|\le 1\\ \pi-2\tan^{-1}x, x>1 \text{ and}\\ -(\pi+2\tan^{-1}), x<-1\end{cases}$$

$$\sin^{-1}x+\cos^{-1}x=\pi/2 \ \text{ for } \ -1\le x\le 1$$

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

A. 1

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

C. -1

D. None of these

Answer: C

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12. For $x, y, z, t \in R$, $\sin^{-1}x + \cos^{-1}y + \sec^{-1}z \geq t^2 - \sqrt{2\pi t} + 3\pi$

The value of $x + y + z$ is equal to

A. 1

B. 0

C. 2

D. -1

Answer: D

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13. For $x, y, z, t \in R$, $\sin^{-1}x + \cos^{-1}y + \sec^{-1}z \geq t^2 - \sqrt{2\pi t} + 3\pi$

The principal value of $\cos^{-1}(\cos 5t^2)$ is

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

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

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

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

Answer: B

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14. For $x, y, z, t \in R$, $\sin^{-1} x + \cos^{-1} y + \sec^{-1} z \geq t^2 - \sqrt{2\pi t} + 3\pi$

The value of $\cos^{-1}(\min\{x, y, z\})$ is

A. 0

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

C. π

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

Answer: C

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Exercise Passage Based Questions

1. Let $f(x)=\tan^{-1}\left(\frac{(x-2)}{x^2+2x+2}\right)$,then $26f'(1)$ is

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2. Let $f(x)=(arc\tan x)^3+(arc\cot x)^3$.If the range of f (x) is $[a,b)$, then find the value of $\frac{b}{7a}$.

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3. If $\sum_{n=0}^{\infty}2\cot^{-1}\left(\frac{n^2+n+4}{2}\right)=k\pi$ then find the value of k

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4. Find the number of solution of the equation

$$\tan\left(\Sigma_{r=1}^{5}\cot^{-1}(2r^2)\right) = \frac{5x+6}{6x+5}.$$

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5.

$$\lim_{z \to 0}\left[\left\{\max\left(\sin^{-1}x+\cos^{-1}x\right)^2,\ \min\left(x^2+4x+7\right)\right\}.\ \frac{\sin^{-1}z}{z}\right]$$

is equal to (where [.] denotes greatest integer function)

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6. If

$\sin(30^\circ + \ \text{arc} \ \ \tan x) = \frac{13}{14}$ and $0 < x < 1$, the value of x is $\frac{a\sqrt{3}}{b}$

, where a and b are positive integers with no common factors . Find the value of $\left(\frac{a+b}{2}\right)$.

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7. Let $f: R \to \left(0, \frac{2\pi}{2}\right]$ defined as $f(x) = \cot^{-1}\left(x^2 - 4x + \alpha\right)$ Then the smallest integral value of α such that, $f(x)$ is into function is

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8. Let L denotes the number of subjective functions $f: A \to B$, where set A contains 4 elementset B contains 3 elements. M denotes number of elements in the range of the function $f(x) = \sec^{-1}(sgmx) + \cos ec^{-1}(sgnx)$ where $sgnx$ denotes signum function of x. And N denotes coefficient of t^5 in $\left(1 + t^2\right)^5 \left(1 + t^3\right)^8$. The value of $(LM + N)$ is λ, then the value of $\frac{\lambda}{19}$ is

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9. Number of solution (s) of the equations $\cos^{-1}(\cos x) = x^2$ is

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10. If

$$\cos^{-1}(x)+\cos^{-1}(y)+\cos^{-1}(z)=\pi\left(\sec^2(u)+\sec^4(v)+\sec^6(w)\right),$$

where u,v, w are least

non-negative angles such that $u < v < w$, then the value of

$x^{2000}+y^{2002}+z^{2004}+\dfrac{36\pi}{u+v+w}$ is ....

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11. Let $f(x)=\cos\left(\tan^{-1}\left(\sin\left(\cot^{-1}x\right)\right)\right)$. The simplest form of f(x) can be written as $\left(\dfrac{x^2+A}{x^2+B}\right)^{1/2}$. Then the value of $(A+B)$ is ....

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12. Prove that:

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

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13. The least natural number 'n' for which $(n-2)x^2+8x+n+4>\sin^{-1}(\sin 12)+\cos^{-1}(\cos 12)\,\forall x\in R$ is

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14. The least natural number 'n' for which $(n-2)x^2+8x+n+4>\sin^{-1}(\sin 12)+\cos^{-1}(\cos 12)\,\forall x\in R$ is

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15. The number of real solution of the equation $\sqrt{1+\cos 2x}=\sqrt{2}\sin^{-1}(\sin x),\ -\pi\le x\le\pi$, is

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Exercise Matching Type Questions

1. Statement I

$y = \tan^{-1}(\tan x)$ and $y = \cos^{-1}(\cos x)$ does not have nay solution , if

Statement II

$y = \tan^{-1}(\tan x) = x - \pi, x \in \left(\frac{\pi}{2}, \frac{3\pi}{2}\right)$ and $y = \cos^{-1}(\cos x) = \Big\{ 2$

A. Statement I is True, Statement II is True, Statement II is a correct explanation for statement I

B. Statement I is True, Statement II is True, Statement II is NOT a correct explanation for Statement I

C. Statement I is True, Statement II is False

D. Statement I is False, Statement II is True.

Answer: A

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2. Statement I $\sin^{-1}\left(\frac{1}{\sqrt{e}}\right) > \tan^{-1}\left(\frac{1}{\sqrt{\pi}}\right)$

Statement II $\sin^{-1} x > \tan^{-1} y$ for $x > y, \forall x, y \in (0, 1)$

A. Statement I is True, Statement II is True, Statement II is a correct explanation for statement I

B. Statement I is True, Statement II is True, Statement II is NOT a correct explanation for Statement I

C. Statement I is True, Statement II is False

D. Statement I is False, Statement II is True.

Answer: A

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3. Statement I $\cos ec^{-1}\left(\frac{1}{2} + \frac{1}{\sqrt{2}}\right) > \sec^{-1}\left(\frac{1}{2} + \frac{1}{\sqrt{2}}\right)$

Statement II $\cos ec^{-1} x > \sec^{-1} x$, if $1 \leq x < \sqrt{2}$

A. Statement I is True, Statement II is True, Statement II is a correct explanation for statement I

B. Statement I is True, Statement II is True, Statement II is NOT a correct explanation for Statement I

C. Statement I is True, Statement II is False

D. Statement I is False, Statement II is True.

Answer: A

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4. Let $f(x) = \sin^{-1}\left(\frac{2x}{1+x^2}\right)$ Statement I $f'(2) = -\frac{2}{5}$ and Statement II $\sin^{-1}\left(\frac{2x}{1+x^2}\right) = \pi - 2\tan^{-1}x, \forall x > 1$

A. Statement I is True, Statement II is True, Statement II is a correct explanation for statement I

B. Statement I is True, Statement II is True, Statement II is NOT a correct explanation for Statement I

C. Statement I is True, Statement II is False

D. Statement I is False, Statement II is True.

Answer: A

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5. Statement I $\sin^{-1} 2x + \sin^{-1} 3x = \frac{\pi}{3}$

$\Rightarrow x = \sqrt{\frac{3}{76}}$ only.

and

Statement II Sum of twp negative angles cannot be positive.

A. Statement I is True, Statement II is True, Statement II is a correct explanation for statement I

B. Statement I is True, Statement II is True, Statement II is NOT a correct explanation for Statement I

C. Statement I is True, Statement II is False

D. Statement I is False, Statement II is True.

Answer: A

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6. Statement I Number of roots of the equation $\cot^{-1}x \cos^{-1}2x + \pi = 0$ is zero.

Statement II Range of $\cot^{-1}x$ and $\cos^{-1}x$ is $(0, \pi)$ and $[0, \pi]$, respectively.

A. Statement I is True, Statement II is True, Statement II is a correct explanation for statement I

B. Statement I is True, Statement II is True, Statement II is NOT a correct explanation for Statement I

C. Statement I is True, Statement II is False

D. Statement I is False, Statement II is True.

Answer: A

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Exercise Single Integer Answer Type Questions

1. Match the following items of Column I with Column II

	Column I		Column II
A.	$\sin^{-1}x + x > 0$, for	(p)	$x < 0$
B.	$\cos^{-1}x - x \geq 0$, for	(q)	$x \in (0, 1]$
C.	$\tan^{-1}x + x < 0$, for	(r)	$x \in [-1, 0)$
D.	$\cot^{-1}x + x > 0$, for	(s)	$x > 0$

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Exercise Subjective Type Questions

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

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2. Solve $\tan^{-1}\left(\frac{x+1}{x-1}\right)+\tan^{-1}\left(\frac{x-1}{x}\right)=\tan^{-1}(-7)$

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3. Let a, b and c be positive real numbers. Then prove that $\tan^{-1}\sqrt{\frac{a(a+b+c)}{bc}}+\tan^{-1}\sqrt{\frac{b(a+b+c)}{ca}}+\tan^{-1}\sqrt{\frac{c(a+b+c)}{ab}}=$

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4. If the sum of n terms of the series $S_n=\cos ec^{-1}\sqrt{10}+\cos ec^{-1}\sqrt{50}+\cos ec^{-1}\sqrt{170}+\dots\dots\dots.+\cos ec^{-1}$

The value of $\left[\lim_{x\to\infty} s_n\right]$ is

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5. If $\sin^{-1} x_i \in [0, 1]\,\forall i = 1, 2, 3, .28$ then find the maximum value of

$$\sqrt{\sin^{-1} x_1}\sqrt{\cos^{-1} x_2} + \sqrt{\sin^{-1} x_2}\sqrt{\cos^{-1} x_3} + \sqrt{\sin^{-1} x_3}\sqrt{\cos^{-1} x_4} + \, + \sqrt{\sin^{-1} x_{28}}\sqrt{\cos^{-1} x_1}$$

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6. Find the value of $\sum_{r=1}^{10} \sum_{s=1}^{10} \tan^{-1}\left(\frac{r}{s}\right)$

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7. Find the value

$$\lim_{n \to \infty} \sum_{k=2}^{n} \cos^{-1}\left(\frac{1 + \sqrt{(k-1)k(k+1)(k+2)}}{k(k+1)}\right)$$

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8. If $m\frac{\tan(\alpha-\theta)}{\cos^2\theta}=n\frac{\tan\theta}{\cos^2(\alpha-\theta)}$ the prove that $2\theta=\alpha-\left[\tan^{-1}\left(\frac{n-m}{n+m}\right)\tan\alpha\right]$

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9. If the quadratic equation ,

$4^{\sec^2\alpha}x^2+2x+\left(\beta^2-\beta+\frac{1}{2}\right)=0$ have real roots, then find all the possible value of $\cos\alpha+\cos^{-1}\beta$.

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Exercise Questions Asked In Previous 13 Years Exam

1. 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: B::C::D

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2. If $0 < x < 1$, then $\sqrt{1+x^2}\left[\left\{x\cos\left(\cot^{-1}x\right)+\sin\left(\cot^{-1}x\right)\right\}^2-1\right]^{1/2}$ is equal to

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

B. x

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

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

Answer: C

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

Then, the value of y is

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

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

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

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

Answer: A

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4. The value of $\cot\left(\sum_{n=1}^{23} \cot^{-1}\left(1 + \sum_{k=1}^{n} 2k\right)\right)$ is

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

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

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

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

Answer: B

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5. If x, y and z are in AP and $\tan^{-1}x, \tan^{-1}y$ and $\tan^{-1}z$ are also in AP, then

A. $x = y = z$

B. $2x = 3y = 6z$

C. $6x = 3y = 2z$

D. $6x = 4y = 3z$

Answer: A

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6. The value of $\cot\left(\cos ec^{-1}\frac{5}{3}+\tan^{-1}.\ \frac{2}{3}\right)$ is

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

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

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

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

Answer: B

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7. If $\sin^{-1}\left(\frac{x}{5}\right)+\cos ec^{-1}\left(\frac{5}{4}\right)=\frac{\pi}{2}$, then the value of x is

A. 1

B. 3

C. 4

D. 5

Answer: B

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8. If $\cos^{-1}x - \cos^{-1}.\frac{y}{2} = \alpha, \text{ then } \ 4x^2 - 4xy\cos\alpha + y^2$ is equal to

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

B. $4\sin^2\alpha$

C. 4

D. $2\sin 2\alpha$

Answer: B

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