MATHS

BOOKS - DEEPTI MATHS (TELUGU ENGLISH)

INVERSE TRIGONOMETRIC FUNCTIONS

Examples

1. $\tan^{-1}\frac{\cos x}{1+\sin x} =$

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

B. $\frac{\pi}{4}-\frac{x}{2}$

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

D. $\frac{\pi}{4}+\frac{x}{2}$

Answer: B

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

A. $\pi/2$

B. $\pi/3$

C. $\pi/4$

D. $\pi/6$

Answer: A

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3. $\tan\left[\frac{\pi}{4} + \frac{1}{2}\cos^{-1}\frac{x}{y}\right] + \tan\left[\frac{\pi}{4} - \frac{1}{2}\cos^{-1}\frac{x}{y}\right] =$

A. x/y

B. y/x

C. 2x/y

D. 2y/x

Answer: D

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

A. $1/2$

B. $1/\sqrt{2}$

C. $\sqrt{3}/2$

D. 1

Answer: C

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5. Range of $\sin^{-1} x + \cos^{-1} x + \tan^{-1} x$ is

A. $[0, \pi)$

B. $(0, \pi]$

C. $[\pi/4, 3\pi/4]$

D. $[0, \pi]$

Answer: C

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6. If $\tan^{-1} 2, \tan^{-1} 3$ are two angles of a triangle, then the third angle is

A. 30°

B. 45°

C. 60°

D. 75°

Answer: B

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7. For $0 \leq \cos^{-1} x \leq \pi$ and $-\frac{\pi}{2} \leq \sin^{-1} x \leq \frac{\pi}{2}$, the value of $\cos\left(\sin^{-1} x + 2\cos^{-1} x\right)$ at $x = \frac{1}{5}$ is

A. $\frac{-2\sqrt{6}}{5}$

B. $\frac{-\sqrt{6}}{5}$

C. $\frac{2\sqrt{6}}{5}$

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

Answer: A

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8. If two angles of a triangle are $\sin^{-1}\left(\frac{1}{\sqrt{5}}\right)$ and $\sin^{-1}\left(\frac{1}{\sqrt{10}}\right)$, then the third angle is

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

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

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

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

Answer: C

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9. If $\sin^{-1}(1) - \sin^{-1}\sqrt{\frac{3}{x}} = \frac{\pi}{6}$ and x is a root of the equation $x^2 + kx - 12 = 0$, then value of k is

A. -2

B. -1

C. 1

D. 2

Answer: B

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10. If $\sec^{-1}\left(\frac{x}{a}\right) - \sec^{-1}\left(\frac{x}{b}\right) = \sec^{-1}(b) - \sec^{-1}(a)$ and $a \neq b$, then x is equal to

A. 1

B. $\pm ab$

C. ab

D. $-ab$

Answer: C

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11. Domain of $\cos^{-1}\left[\log_2\left(x^2 + 5x + 8\right)\right]$ is

A. [-4, -3]

B. [-3, -2]

C. [-2, -1]

D. [-1, 0]

Answer: B

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Exercise 1

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

A. $\pi/12$

B. $\pi/3$

C. $3\pi/4$

D. $\pi/6$

Answer: B

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

A. $5\pi/4$

B. $3\pi/4$

C. $-3\pi/4$

D. $-5\pi/4$

Answer: B

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

A. $\pi/12$

B. $-\pi/3$

C. $3\pi/4$

D. $\pi/6$

Answer: B

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

A. 10

B. $10 - 3\pi$

C. $3\pi - 10$

D. none

Answer: C

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5. $2\tan^{-1}(3/4) =$

A. $\sin^{-1}(24/25)$

B. $\sin^{-1}(12/13)$

C. $\sin^{-1}(23/24)$

D. $\sin^{-1}(13/12)$

Answer: A

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

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

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

C. $\cos\left(2\tan^{-1}\frac{1}{7}\right)$

D. $\cos\left(4\tan^{-1}\frac{1}{7}\right)$

Answer: C

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7. $\sin\left[4 \text{ arc } \tan\frac{1}{3}\right] =$

A. 24/25

B. 25/24

C. 27/29

D. 29/27

Answer: A

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8. $\tan\left(\frac{1}{2}\cos^{-1}0\right) =$

A. 0

B. -1

C. 1

D. $1/2$

Answer: C

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9. $\tan\left[\frac{1}{2}\cos^{-1}\left(\frac{\sqrt{5}}{3}\right)\right] =$

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

B. $\frac{3-\sqrt{5}}{2}$

C. $\frac{4+\sqrt{5}}{2}$

D. $\frac{4-\sqrt{5}}{2}$

Answer: B

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

A. 3

B. 5

C. 7

D. 9

Answer: C

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

A. 1

B. 0

C. -1

D. 5

Answer: B

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12. $\sin\left\{\sin^{-1}\frac{1}{2}+\cos^{-1}\frac{1}{2}\right\}=$

A. 1

B. 2

C. 3

D. 4

Answer: A

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

A. 5

B. 10

C. 15

D. 20

Answer: C

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

A. 1

B. 2

C. 4

D. 5

Answer: A

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

A. 33/65

B. 65/33

C. 23/65

D. 65/23

Answer: A

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

A. $11/6$

B. $13/6$

C. $17/6$

D. none

Answer: C

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

A. $\sin^{-1}\left(\frac{56}{65}\right)$

B. $\sin^{-1}\left(\frac{33}{65}\right)$

C. $\sin^{-1}\left(\frac{77}{85}\right)$

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

Answer: C

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18. $\cos^{-1}\left(\frac{3}{5}\right)+\cos^{-1}\left(\frac{12}{13}\right)=$

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

B. $\cos^{-1}\left(\frac{33}{65}\right)$

C. $\cos^{-1}\left(\frac{77}{85}\right)$

D. $\cos^{-1}\left(\frac{12}{13}\right)$

Answer: A

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19. $\sin^{-1}\left(\frac{4}{5}\right) - \sin^{-1}\left(\frac{5}{13}\right) =$

A. $\sin^{-1}\left(\frac{56}{65}\right)$

B. $\sin^{-1}\left(\frac{33}{65}\right)$

C. $\sin^{-1}\left(\frac{77}{85}\right)$

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

Answer: B

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20. $\cot^{-1}\left(\frac{4}{3}\right) - \cot^{-1}\left(\frac{15}{8}\right) =$

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

B. $\cot^{-1}\left(\frac{84}{65}\right)$

C. $\cot^{-1}\left(\frac{84}{85}\right)$

D. $\cot^{-1}\left(\frac{84}{13}\right)$

Answer: D

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21. $\cos^{-1}\left(\frac{5}{13}\right)+\cos^{-1}\left(\frac{3}{5}\right)=\cos^{-1}x \Rightarrow x=$

A. $\frac{3}{65}$

B. $\frac{-36}{65}$

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

D. -1

Answer: C

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22. $\sin^{-1}\left(\frac{24}{25}\right)+\tan^{-1}\left(\frac{5}{12}\right)=$

A. $\tan^{-1}\left(\frac{27}{11}\right)$

B. $\tan^{-1}\left(\frac{16}{63}\right)$

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

D. $\cos^{-1}\left(-\frac{36}{325}\right)$

Answer: D

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23. $\sin^{-1}\left(\frac{3}{5}\right)-\cos^{-1}\left(\frac{12}{13}\right)=$

A. $\tan^{-1}\left(\frac{27}{11}\right)$

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

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

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

Answer: C

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24. $\sin^{-1}\left(\frac{3}{5}\right)+\cos^{-1}\left(\frac{5}{\sqrt{34}}\right)=$

A. $\tan^{-1}\left(\frac{27}{11}\right)$

B. $\tan^{-1}\left(\frac{16}{63}\right)$

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

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

Answer: A

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

A. $-1/3$

B. 0

C. $1/3$

D. $4/9$

Answer: B

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26.

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

A. $5\pi/6$

B. $5\pi/12$

C. $7\pi/12$

D. $7\pi/6$

Answer: B

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

A. $\frac{19\pi}{12}$

B. $\frac{35\pi}{12}$

C. $\frac{47\pi}{12}$

D. $\frac{43\pi}{12}$

Answer: D

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

A. $3\pi/4$

B. $\pi/2$

C. $\pi/4$

D. π

Answer: A

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

A. $\pi/2$

B. $\pi/3$

C. $\pi/4$

D. $-3\pi/4$

Answer: C

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30. If $x > 0, y > 0$ and $x > y$, then $\tan^{-1}(x/y) + \tan^{-1}[(x+y)/(x-y)]$ is equal to

A. $-\pi/4$

B. $\pi/4$

C. $3\pi/4$

D. none of these

Answer: C

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31. $\tan^{-1}\frac{1}{4}+\tan^{-1}\frac{2}{9}=$

A. $\pi/4$

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

C. $2\tan^{-1}3/5$

D. $-\pi/4$

Answer: B

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

A. $\pi/2$

B. $\pi/4$

C. $\pi/3$

D. $\pi/6$

Answer: B

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33. $\tan^{-1}\frac{3}{2}-\tan^{-1}\frac{1}{5}=$

A. π

B. $\pi/2$

C. $\pi/4$

D. $3\pi/4$

Answer: C

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34. $\sec^{-1}\frac{\sqrt{34}}{5} + \cos ec^{-1}\sqrt{17} =$

A. π

B. $\pi/2$

C. $\pi/4$

D. $3\pi/4$

Answer: C

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

A. $3/17$

B. $4/17$

C. $5/17$

D. $6/17$

Answer: D

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36. $2\tan^{-1}\frac{1}{3}+\tan^{-1}\frac{1}{7}=$

A. π

B. $\pi/2$

C. $\pi/4$

D. $3\pi/4$

Answer: C

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37. $4\tan^{-1}\left(\frac{1}{5}\right) - \tan^{-1}\left(\frac{1}{239}\right) =$

A. π

B. $\pi/2$

C. $\pi/4$

D. $3\pi/4$

Answer: C

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

A. $\pi/3$

B. $\pi/4$

C. $\pi/2$

D. 0

Answer: C

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39. $\sin^{-1}\left(\frac{16}{65}\right) + 2\tan^{-1}\left(\frac{1}{5}\right) =$

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

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

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

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

Answer: D

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40. $\cos^{-1}\left(\frac{63}{65}\right) + 2\tan^{-1}\left(\frac{1}{5}\right) =$

A. $\tan^{-1}\left(\frac{27}{11}\right)$

B. $\tan^{-1}\left(\frac{16}{63}\right)$

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

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

Answer: D

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41. $\tan^{-1}\frac{5}{6}+\frac{1}{2}\tan^{-1}\frac{11}{60}=$

A. π

B. $\pi/2$

C. $\pi/4$

D. $3\pi/4$

Answer: C

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42. $2\tan^{-1}\frac{1}{5}+\tan^{-1}\frac{1}{7}+2\tan^{-1}\frac{1}{8}=$

A. π

B. $\pi/2$

C. $\pi/4$

D. $3\pi/4$

Answer: C

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43. $4\tan^{-1}\frac{1}{5}-\tan^{-1}\frac{1}{70}+\tan^{-1}\frac{1}{99}=$

A. π

B. $\pi/2$

C. $\pi/4$

D. $3\pi/4$

Answer: C

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44. $\tan^{-1}\frac{1}{3}+\tan^{-1}\frac{1}{5}+\tan^{-1}\frac{1}{7}+\tan^{-1}\frac{1}{8}=$

A. π

B. $\pi/2$

C. $\pi/4$

D. $3\pi/4$

Answer: C

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45. The value of $\cot\left[\cot^{-1}7+\cot^{-1}8+\cot^{-1}(18)\right]$ is

A. 4

B. 5

C. 6

D. 3

Answer: D

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

A. $\sin^{-1}x+\sin^{-1}y$

B. $\cos^{-1}x+\cos^{-1}y$

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

D. $\cot^{-1}x+\cot^{-1}y$

Answer: A

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47. $\cos^{-1}\left(xy - \sqrt{1-x^2}\sqrt{1-y^2}\right) =$

A. $\sin^{-1}x + \sin^{-1}y$

B. $\cos^{-1}x + \cos^{-1}y$

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

D. $\cot^{-1}x + \cot^{-1}y$

Answer: B

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

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

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

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

D. $5\tan^{-1}x$

Answer: B

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

A. x

B. 2x

C. x/2

D. none

Answer: A

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50. $\tan\left(\cos^{-1}x\right) =$

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

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

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

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

Answer: A

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

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

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

A. $\left(\dfrac{x^2+2}{x^2+3}\right)^{1/2}$

B. $\left(\dfrac{x^3+3}{x^2+4}\right)^{1/2}$

C. $\left(\dfrac{x^2+1}{x^2+2}\right)^{1/2}$

D. x

Answer: C

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53. $2\tan^{-1}(\cos x) =$

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

B. $\tan^{-1}(2\cot x \cdot \cos ecx)$

C. $\tan^{-1}(2\sin x \cdot \cos ecx)$

D. $\tan^{-1}(2\sin x \cdot \cot x)$

Answer: B

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54. $\tan\left(2\tan^{-1}(\sin x)\right) =$

A. $2\tan x \sin x$

B. $2\tan x \cos ecx$

C. $2\tan x \sec x$

D. $2\cot x \sin x$

Answer: C

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55. $\tan^{-1}(\cot x) - \tan^{-1}(\cot 2x) =$

A. 2x

B. x

C. 3x

D. x/2

Answer: B

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56. $2\tan^{-1}\left(\frac{\sqrt{a-b}}{a+b}\tan\frac{x}{2}\right) =$

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

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

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

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

Answer: A

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57. $\tan\left[\frac{1}{2}\sin^{-1}\frac{2a}{1+a^2}+\frac{1}{2}\cos^{-1}\frac{1-a^2}{1+a^2}\right]=$

A. $\frac{2a}{1+a^2}$

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

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

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

Answer: B

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

A. 0

B. 1

C. $\frac{x-y}{1+xy}$

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

Answer: C

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

A. 0

B. 1

C. $\frac{x-y}{1+xy}$

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

Answer: B

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60. The value of $\tan\left[\tan^{-1}\left(\frac{1}{a+b}\right)+\tan^{-1}\left(\frac{b}{a^2+ab+1}\right)\right]$ is

A. a

B. 1/a

C. b

D. 1/b

Answer: B

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

A. b/a

B. a/b

C. 2a/b

D. 2b/a

Answer: D

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62. $\cot^{-1}\left\{\frac{\sqrt{1-\sin x}+\sqrt{1+\sin x}}{\sqrt{1-\sin x}-\sqrt{1+\sin x}}\right\} =$

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

B. $2\pi - x$

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

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

Answer: A

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63. $\tan^{-1}\frac{a-b}{1+ab} + \tan^{-1}\frac{b-c}{1+bc} + \tan^{-1}\frac{c-a}{1+ca} =$

A. $\pi/4$

B. $\pi/2$

C. 0

D. π

Answer: C

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64. Id a, b, c are distinct non-zero real numbers having the same sign. Prove that

$$\cot^{-1}\left(\frac{ab+1}{a-b}\right)+\cot^{-1}\left(\frac{bc+1}{b-c}\right)+\cot^{-1}\left(\frac{ca+1}{c-a}\right)=\pi(\text{ or })2\pi.$$

A. 0

B. $\pi/2$

C. π

D. $3\pi/2$

Answer: C

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65. If a,b,c, are positive then

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

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

A. 0

B. π

C. $\pi/2$

D. $\pi/4$

Answer: A

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66.

$$\tan^{-1}\frac{yz}{x\sqrt{x^2+y^2+z^2}}+\tan^{-1}\frac{zx}{y\sqrt{x^2+y^2+z^2}}+\tan^{-1}\frac{xy}{z\sqrt{x^2+y^2+z}}$$

A. π

B. $\pi/2$

C. $\pi/3$

D. $\pi/4$

Answer: B

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67.

$$\tan^{-1}\frac{c_1x-y}{c_1y+x}+\tan^{-1}\frac{c_2-c_1}{1+c_2c_1}+\tan^{-1}\frac{c_3-c_2}{1+c_3c_2}+\ldots\tan^{-1}\frac{1}{c_n}=$$

A. $\tan^{-1}(2x/y)$

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

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

D. none of these

Answer: C

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68. If

$$\tan^{-1}\frac{1}{1+2}+\tan^{-1}\frac{1}{1+(2)(3)}+\tan^{-1}\frac{1}{1+(3)(4)}+\ldots\tan^{-1}\frac{1}{1+n(n-$$

, then θ =

A. $\frac{n}{n+1}$

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

C. $\frac{n}{n+2}$

D. $\frac{n-1}{n+2}$

Answer: B

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69. If $a_1, a_2, a_3, \ldots., a_n$ is an A.P. with common difference d, then

$$\tan\left[\tan^{-1}\left(\frac{d}{1+a_1a_2}\right)+\tan^{-1}\left(\frac{d}{1+a_2a_3}\right)+\ldots\tan^{-1}\left(\frac{d}{1+a_{n-1}a_n}\right)\right.=$$

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

B. $\frac{(n-1)d}{1+a_1a_n}$

C. $\frac{nd}{1+a_1a_n}$

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

Answer: B

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70. If $x^2+y^2+z^2=r^2$, then $\tan^{-1}\left(\frac{xy}{zr}\right)+\tan^{-1}\left(\frac{yz}{xr}\right)+\tan^{-1}\left(\frac{xz}{yr}\right)=$

A. π

B. $\pi/2$

C. 0

D. none

Answer: D

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71. If $u = \tan^{-1}\left(\frac{1}{\sqrt{\cos 2\theta}}\right) - \tan^{-1}\left(\sqrt{\cos 2\theta}\right)$, then sin u=

A. $\cot^2\theta$

B. $\sin^2\theta$

C. $\cos^2\theta$

D. $\tan^2\theta$

Answer: C

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72. If $0 \leq x \leq \frac{1}{2}$, then $\sin^{-1} x + \sin^{-1}\left(\frac{x}{2} - \frac{\sqrt{3-3x^2}}{2}\right) =$

A. π

B. $\pi/2$

C. $\pi/3$

D. $\pi/4$

Answer: C

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

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

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

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

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

Answer: A

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74. If y is infinite and $\tan^{-1} y = 4\tan^{-1} x$ then

A. $x = 1 \pm \sqrt{2}$

B. $x = \sqrt{2} \pm \sqrt{3}$

C. $x = 3 \pm 2\sqrt{2}$

D. all values of x

Answer: A

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

A. xyz

B. 3xyz

C. $\sqrt{xyz}$

D. 0

Answer: A

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76. If $\tan^{-1} x + \tan^{-1} y + \tan^{-1} z = \pi/2$ then 1 - xy - yz - zx =

A. 1

B. 0

C. -1

D. 2

Answer: B

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77. If $\cos^{-1} x + \cos^{-1} y + \cos^{-1} z = \pi$, then $x^2 + y^2 + z^2 + 2xyz =$

A. 0

B. 1

C. xyz

D. 2xyz

Answer: B

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78. If $\sin^{-1} x + \sin^{-1} y + \sin^{-1} z = \pi/2$, then $x^2 + y^2 + z^2 + 2xyz =$

A. 0

B. 1

C. xyz

D. 2xyz

Answer: B

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79. If $\sin^{-1}x + \sin^{-1}y + \sin^{-1}z = \pi$ then prove that n $x\sqrt{1-x^2} + y\sqrt{1-y^2} + z\sqrt{1-z^2} = 2xyz$

A. 0

B. 1

C. xyz

D. 2xyz

Answer: D

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80. If $\sec^{-1}\sqrt{1-x^2} + \cos ec^{-1}\frac{\sqrt{1+y^2}}{y} + \cot^{-1}\frac{1}{z} = 3\pi$ then

A. x + y + z = 0

B. x + y + z = 1

C. x + y + z = xyz

D. none

Answer: C

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81. If $\cos^{-1}\left(\frac{x}{a}\right)+\cos^{-1}\left(\frac{y}{b}\right)=\theta$, then $\frac{x^2}{a^2}-\frac{2xy}{ab}\cos\theta+\frac{y^2}{b^2}=$

A. $\sin^2\theta$

B. $\cos^2\theta$

C. $\tan^2\theta$

D. $\cot^2\theta$

Answer: A

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82. If $\cos^{-1}(x/2)+\cos^{-1}(y/3)=\theta$ then $9x^2-12xy\cos\theta+4y^2=$

A. $36\sin^2\theta$

B. $37\sin^2\theta$

C. $39\sin^2\theta$

D. none of these

Answer: A

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

A. $2\pi/3$

B. $\pi/3$

C. $\pi/6$

D. π

Answer: B

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

A. -1

B. 0

C. 1

D. 3

Answer: B

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

A. $\cos 2\alpha$

B. $\tan 2\alpha$

C. $\sin 2\alpha$

D. none

Answer: C

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86. If $\tan^{-1}(1/7) = \alpha, \tan^{-1}(1/3) = \beta$ then $\cos 2\alpha =$

A. $\sin 2\beta$

B. $\sin 4\beta$

C. $\sin 3\beta$

D. none of these

Answer: B

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

A. $3/28$

B. $\sqrt{3}/28$

C. $\sqrt{3/28}$

D. $3/\sqrt{28}$

Answer: C

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88. If $\tan^{-1} 2x + \tan^{-1} 3x = \pi/4$, then x =

A. $1/4$

B. $1/6$

C. 2

D. No solution

Answer: B

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89. If $2\tan^{-1}x + \sec^{-1}x = \pi/2$ then x =

A. $1/4$

B. $1/6$

C. 2

D. No solution

Answer: D

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90. If $\tan^{-1}\frac{a}{x} + \tan^{-1}\frac{b}{x} = \frac{\pi}{2}$ then x =

A. ab

B. 2ab

C. $\sqrt{ab}$

D. $\sqrt{2ab}$

Answer: C

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91. If $\tan^{-1}(1/(a-1)) = \tan^{-1}(1/x) + \tan^{-1}\left[1/\left(a^2 - x + 1\right)\right]$, then x =

A. $2a$ or $a^2 + a + 1$

B. a or $a^2 - a + 1$

C. a or $a^2 + 2a + 1$

D. none of these

Answer: B

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92. If $\sin^{-1}\frac{5}{x}+\sin^{-1}\frac{12}{x}=\frac{\pi}{2}$, then x =

A. 10

B. 11

C. 12

D. 13

Answer: D

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93. If $\sin^{-1}(x/5)+\cos ec^{-1}(5/4)=\pi/2$ then a value of x is

A. 1

B. 3

C. 4

D. 5

Answer: B

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94. If $\sin^{-1} x - \cos^{-1} x = \frac{\pi}{6}$ then find x.

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

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

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

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

Answer: B

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

A. 0, 1/2

B. $-1, 1/2$

C. $1, \ -1/2$

D. $1/2, 1$

Answer: A

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

A. no solution

B. unique solution

C. infinite number of solutions

D. none

Answer: B

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97. If $\tan^{-1}(x+1)+\tan^{-1}(x-1)=\tan^{-1}(4/7)$, then x =

A. $1/4, 1/2$

B. $-4, 1/2$

C. $2, 1/4$

D. No solution

Answer: B

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98. A solution of the equation $\tan^{-1}(1+x)+\tan^{-1}(1-x)=\pi/2$ is

A. x = 1

B. x = -1

C. x = 0

D. $x=\pi$

Answer: C

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99. $\sin^{-1} x - \cos^{-1} x = \sin^{-1}(3x - 2)$, if $x > 0$ then x =

A. $0, 1/2$

B. $-1, 1/2$

C. $1, -1/2$

D. $1/2, 1$

Answer: D

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100. If $2\tan^{-1}(\cos x) = \tan^{-1}(2\cos ecx)$ then x =

A. $\pi/4$

B. $\pi/6$

C. $\pi/2$

D. No solution

Answer: A

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101. $\tan\left(\cos^{-1}1/x\right) = \sin\left(\cot^{-1}1/2\right)$, if $x \neq 0$ then x =

A. $\pm 3/5$

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

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

D. $\pm\sqrt{3}/5$

Answer: B

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

A. $\sqrt{5}$

B. $\sqrt{5}/3$

C. 1

D. $2/3$

Answer: B

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

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

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

Answer: A

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104. If $\tan^{-1}\left(\frac{x-1}{x-2}\right)+\cot^{-1}\left(\frac{x+2}{x+1}\right)=\frac{\pi}{4}$, then x =

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

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

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

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

Answer: B

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

A. 2

B. -2

C. 1

D. No solution

Answer: A

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

A. 2

B. -2

C. 1

D. No solution

Answer: A

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107. If $\cot^{-1}\frac{4}{3}+\cot^{-1}\frac{5}{3}=\tan^{-1}k$, then k =

A. 29/27

B. $-29/27$

C. $27/11$

D. $-27/29$

Answer: C

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108. If $\sec^{-1}\frac{1}{\sqrt{1-x^2}}+\cot^{-1}\frac{\sqrt{1-x^2}}{x}=\sin^{-1}k$, then the value of k is

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

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

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

D. 2x

Answer: B

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109. If $\cos^{-1} x = \cot^{-1}(4/3) + \tan^{-1}(1/7)$ then x =

A. $1/2$

B. $\sqrt{3}/2$

C. $1/\sqrt{2}$

D. $3/5$

Answer: C

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110. If $\sin^{-1}(3/5) + \sin^{-1}(5/13) = \sin^{-1} x$, then x =

A. 51/65

B. 52/65

C. 56/65

D. none of these

Answer: C

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111. If $\cos^{-1}\frac{3}{5} - \sin^{-1}\frac{4}{5} = \cos^{-1} x$ then x =

A. -1

B. 1

C. 0

D. $\pi/2$

Answer: B

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112. 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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113. If $\cot^{-1} x + \sin^{-1}\left(1/\sqrt{5}\right) = \pi/4$, then the value of x is

A. 2

B. 1

C. 3

D. none

Answer: C

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114. If $\cos ec^{-1}x = 2\cot^{-1}7 + \cos^{-1}(3/5)$ then the value of x is

A. 44/117

B. 125/117

C. $24/7$

D. $5/3$

Answer: B

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115. If $\tan^{-1}(\sec x + \tan x) = \pi/4 + kx$ then k =

A. 2

B. 4

C. $1/2$

D. $1/4$

Answer: C

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116. Solve

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

A. $\sqrt{2}$

B. $1/\sqrt{2}$

C. $\sqrt{3}$

D. $1/\sqrt{3}$

Answer: D

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117. If $\frac{1}{2}\sin^{-1}\left[\frac{3\sin 2\theta}{5+4\cos 2\theta}\right] = \tan^{-1} x$, then x =

A. $\tan 3\theta$

B. $3\tan\theta$

C. $(1/3)\tan\theta$

D. $3\cot\theta$

Answer: C

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118. If $\sec^{-1}\left(\frac{x}{a}\right) - \sec^{-1}\left(\frac{x}{b}\right) = \sec^{-1}(b) - \sec^{-1}(a)$ and $a \neq b$, then x is equal to

A. ab

B. b/a

C. a/b

D. 1/ab

Answer: A

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119. If $a = \sin\left(\cot^{-1} x\right)$ and $b = \cot\left(\sin^{-1} x\right)$ where $x > 0$, then $1/x^2 - x^2 =$

A. $\frac{b^2}{a^2}$

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

C. $\frac{a^2+1}{b^2-1}$

D. none of these

Answer: A

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120. If $\tan^{-1} 2x + \tan^{-1} 3x = \pi/4$, then x =

A. $1/2$

B. $1/4$

C. $1/6$

D. 6

Answer: C

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121. If $\tan^{-1}(x+1) + \tan^{-1}(x-1) = \tan^{-1}(8/31)$, then x =

A. 1

B. $1/2$

C. $-1/2$

D. $1/4$

Answer: D

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122. If $\tan^{-1}(1+x)+\tan^{-1}(1-x)=\pi/4$ then x =

A. 2

B. ± 2

C. $\sqrt{2}$

D. $\pm\sqrt{2}$

Answer: D

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123. A solution of the equation $\tan^{-1}(1+x)-\tan^{-1}(x-1)=\pi/2$ is

A. x = 1

B. x = -1

C. x = 0

D. $x = \pi$

Answer: C

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124. $\left(\tan^{-1} x\right)^2 + \left(\cot^{-1} x\right)^2 = 5\pi^2/8 \Rightarrow x =$

A. -1

B. 1

C. 0

D. $\pi\frac{\sqrt{5}}{8}$

Answer: A

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125. The arithmetic mean of the non-zero solutions of the equation $\tan^{-1}\frac{1}{2x+1}+\tan^{-1}\frac{1}{4x+1}=\tan^{-1}\frac{2}{x^2}$ is

A. $2/3$

B. $7/3$

C. $7/6$

D. $11/6$

Answer: C

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126. The number of real solutions of $\tan^{-1}\sqrt{x(x+1)}+\sin^{-1}\sqrt{x^2+x+1}=\pi/2$ is

A. zero

B. one

C. two

D. infinite

Answer: C

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127. An integral solution of the equation $\tan^{-1} x + \tan^{-1}(1/y) = \tan^{-1} 3$ is

A. (1, 4)

B. (4, 13)

C. (2, 1)

D. none of these

Answer: D

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128. The solution of $\sin^{-1}\frac{2a}{1+a^2} - \cos^{-1}\frac{1-b^2}{1+b^2} = \tan^{-1}\frac{2x}{1-x^2}$ is

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

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

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

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

Answer: B

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129. If $\sin^{-1}(\tan\pi/4) - \sin^{-1}\sqrt{3/x} - \pi/6 = 0$, then x is a root of the equation

A. $x^2 - x - 6 = 0$

B. $x^2 + x - 6 = 0$

C. $x^2 - x - 12 = 0$

D. $x^2 + x - 12 = 0$

Answer: C

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130. If $\theta = \sin^{-1} x + \cos^{-1} x - \tan^{-1} x, 0 \leq x \leq 1$, then the smallest interval in which θ lies is given by

A. $\pi/4 \leq \theta \leq \pi/2$

B. $-\pi/4 \leq \theta \leq 0$

C. $0 \leq \theta \leq \pi/4$

D. $\pi/2 \leq \theta \leq 3\pi/4$

Answer: C

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131. The trigonometric equation $\sin^{-1} x = 2\sin^{-1} a$, has a solution for

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

B. all real values of a

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

D. $|a| \geq \frac{1}{\sqrt{2}}$

Answer: C

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

A. x

B. x^2

C. 1/x

D. $1/x^2$

Answer: B

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133. The domain of $\sin^{-1} x$ is

A. $[0, \pi]$

B. $[-1, 1]$

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

D. $(-1, 1)$

Answer: B

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134. The domain of $\cos^{-1} \sqrt{2x}$ is

A. $[-1, 1]$

B. $[-1/2, 1/2]$

C. $[0, 1/2]$

D. $(1, 1/2)$

Answer: C

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135. The domain of $\sin^{-1}\left[\log_2\left(x^2/2\right)\right]$ is

A. $[-2, -1]$

B. [1, 2]

C. $[-2, -1] \cup [1, 2]$

D. none

Answer: C

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136. The domain of $\cos^{-1}\left(\frac{2}{2+\sin x}\right)$ in $[0, 2\pi]$ is

A. $[0, \pi]$

B. $[0, \pi/2]$

C. $[\pi/2, \pi]$

D. none

Answer: A

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137. The range of $\sin^{-1} 5x$ is

A. $[-\pi/3, \pi/3]$

B. $[-\pi/2, \pi/2]$

C. $[-\pi/3, \pi/4]$

D. none

Answer: B

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138. The range of $\sin^{-1} x + \cos^{-1} x$ is

A. $\{\pi\}$

B. $\{2\pi\}$

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

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

Answer: D

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139. The range of $\sin^{-1} x - \cos^{-1} x$ is

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

B. $\left[\frac{5\pi}{3}, \frac{\pi}{3}\right]$

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

D. none

Answer: A

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

A. $\pi/4$

B. $3\pi/4$

C. $\pi/6$

D. $\pi/3$

Answer: B

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Exercise 2 Special Type Questions Set 1

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

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

A. only I is true

B. only II is true

C. both I and II are true

D. neither I nor II are true

Answer: D

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

II. $\cos\left(\tan^{-1}\frac{7}{24}\right) = \frac{24}{25}$

A. only I is true

B. only II is true

C. both I and II are true

D. neither I nor II are true

Answer: C

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

II. $\cos\left\{\cos^{-1}\left(\frac{-1}{7}\right) + \sin^{-1}\left(\frac{-1}{7}\right)\right\} = 0$

A. only I is true

B. only II is true

C. both I and II are true

D. neither I nor II are true

Answer: C

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4. I. $\sin^{-1} x = x$ has only one solution

II. $\cos^{-1} x = x$ has only one solution

A. only I is true

B. only II is true

C. both I and II are true

D. neither I nor II are true

Answer: C

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5. I. The value of $\sec^2\left(\tan^{-1} 2\right) + \cos ec^2\left(\cot^{-1} 3\right)$ is 10

II. The value of $\tan\left\{\sin^{-1}\left(\frac{3}{5}\right) + \cot^{-1}\left(\frac{3}{2}\right)\right\}$ is $\frac{16}{7}$

A. only I is true

B. only II is true

C. both I and II are true

D. neither I nor II are true

Answer: D

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6. I. The value of $\sin^{-1}(\sin 5)$ is $5 - 2\pi$

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

A. only I is true

B. only II is true

C. both I and II are true

D. neither I nor II are true

Answer: C

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Exercise 2 Special Type Questions Set 2

1. The ascending order of $A = \sin^{-1}(\log_3 {}^2), B = \cos^{-1}\left(\log_3\left(\frac{1}{2}\right)\right), C = \tan^{-1}\left(\log_{1/3} 2\right)$ is

A. C, B, A

B. B, A, C

C. C, A, B

D. B, C, A

Answer: C

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2. The ascending order of $A = \sin^{-1}\left(\sin\frac{8\pi}{7}\right), \cos^{-1}\left(\cos\frac{8\pi}{7}\right), C = \tan^{-1}\left(\tan\frac{8\pi}{7}\right)$ is

A. B, A, C

B. B, C, A

C. A, B, C

D. A, C, B

Answer: D

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3. The ascending order of $A = \sin\left[\sin^{-1}\frac{3}{5} + \sin^{-1}\frac{8}{17}\right], B = \cos\left[\cos^{-1}\frac{3}{5}\cos^{-1}\frac{12}{13}\right], C = \sin\left[\sin^{-}\right.$ is

A. A, B, C

B. B, C, A

C. C, A, B

D. C, B, A

Answer: D

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Exercise 2 Special Type Questions Set 4

1. A : The maximum value of $f(x) = \sin^{-1} x + \cos^{-1} x - \tan^{-1} x$ is $3\pi/4$

R : $\sin^{-1} x + \cos^{-1} x = \pi/2 \forall x \in R$

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true but R is not correct explanation of A

C. A is true but R is false

D. A is false but R is true

Answer: D

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2. A : The value of $\frac{\tan^{-1}(4/3)}{\tan^{-1}(1/2)}$ is equal to 2.

R : $\forall x \in [0, 1], \tan^{-1}\left(\frac{2x}{1-x^2}\right) = 2\tan^{-1} x$

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true but R is not correct explanation of A

C. A is true but R is false

D. A is false but R is true

Answer: A

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3. A : If $4\sin^{-1}x + \cos^{-1}x = \pi$ then the value of $4\cos^{-1}x + \sin^{-1}x$ is $3\pi/2$

R : If a $\cos^{-1}x + b\sin^{-1}x = k$ then the value of $b\cos^{-1}x + a\sin^{-1}x$ is $(a+b)\frac{\pi}{2} - k$

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true but R is not correct explanation of A

C. A is true but R is false

D. A is false but R is true

Answer: A

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4. A : The domain of $\sin^{-1} 2x$ is $[-1/2, 1/2]$

R : The domain of $\sin^{-1} x$ is $[-1, 1]$

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true but R is not correct explanation of A

C. A is true but R is false

D. A is false but R is true

Answer: A

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5. A : The range of $\sin^{-1} 2x + \cos^{-1} 2x$ is $\{\pi\}$

R : The range of $\sin^{-1} x + \cos^{-1} x$ is $\{\pi/2\}$

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true but R is not correct explanation of A

C. A is true but R is false

D. A is false but R is true

Answer: D

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