MATHS

BOOKS - FULL MARKS MATHS (TAMIL ENGLISH)

INVERSE TRIGONOMETRIC FUNCTIONS

Example Questions Solved

1. Find the principal value of $\sin^{-1}\left(-\frac{1}{2}\right)$ (in radius and degrees .)

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2. Find the principal value of $\sin^{-1}$ (2), if it exists .

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3. Find the principal value of

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

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

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

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

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5. Find the principal value of

$\cos^{-1}\frac{\sqrt{3}}{2}$

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6. Find

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

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

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

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

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8. Find the principal value of

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

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9. Find

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

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

$(iii)\tan(\tan^{-1}(2019))$

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

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11. Prove that $\tan(\sin^{-1}x)=\frac{x}{\sqrt{1-x^2}}-1<x<1.$

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12. Find the principal value of

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

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

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

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14. If $\cot^{-1}\left(\frac{1}{7}\right) = \theta$, find the value of $\cos\theta$.

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15. Show that $\operatorname{cosec}^{-1}\left(\frac{x}{\sqrt{x^2-1}}\right) = \sec^{-1}(x), |x| > 1$

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16. Prove that $\frac{\pi}{2} \leq \sin^{-1}x + 2\cos^{-1}x < \frac{3\pi}{2}$

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17. Simplify

$(I)\cos^{-1}\left(\cos\left(\frac{13\pi}{3}\right)\right)$

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

$(iii)\sec^{-1}\left(\sec\left(\frac{5\pi}{3}\right)\right)$

$(iv)\sin^{-1}[\sin 10]$

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18. Find the value of

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

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

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20. Evaluate $\sin\left[\sin^{-1}\left(\frac{3}{5}\right)+\sin^{-1}\left(\frac{4}{5}\right)\right]$.

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21. Prove that :

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

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22. If $\cos^{-1}x+\cos^{-1}y+\cos^{-1}z=\pi$ and $0<x,y,z<1$ show that

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

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23. If $a_1, a_2, a_3, \ldots . a_n$ is an aritmetic progression with common difference d. prove that

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

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24. solve $\tan^{-1}\left(\frac{1-x}{1+x}\right)=\frac{1}{2}\tan^{-1}x \text{for} x>0$

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25. Solve :

$\sin^{-1}x>\cos^{-1}x$

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26. Show that $\cot\left(\sin^{-1}x\right)\frac{\sqrt{1-x^2}}{x},\ -1\leq x\leq 1 \text{ and } x\neq 0$

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27. solve $\tan^{-1} 2x + \tan^{-1} 3x = \frac{\pi}{4}$, if $6x^2 < 1$.

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

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29. Solve $\cos\left(\sin^{-1}\left(\frac{x}{\sqrt{1+x^2}}\right)\right) = \sin\left\{\cot^{-1}\left(\frac{3}{4}\right)\right\}$

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Additional Questions Solved

1. Find

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

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2. Find

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

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3. Find the principal value of

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

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

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5. Find the principal value of

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

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6. Find the value of $\sec^2\left(\cot^{-1}3\right)+\operatorname{cosec}\left(\tan^{-1}2\right)$

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

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8. Solve the following equation : $\sin^{-1}(1-x)-2\sin^{-1}x=\frac{\pi}{2}$

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

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

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

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12. Prove : $2\sin^{-1}\frac{3}{5} = \tan^{-1}\frac{24}{7}$

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

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14. solve for x : $\tan\left(\cos^{-1} x\right) = \sin\left(\cot^{-1} \frac{1}{2}\right)$

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

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16. IF $\sin^{-1} X + \sin^{-1} y + \sin^{-1} z = \pi,$ then prove 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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17. Prove that : $\cos\left[\tan^{-1}\left\{\sin\left(\cot^{-1} x\right)\right\}\right] = \sqrt{\frac{x^2+1}{x^2+2}}$

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

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

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

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21. Evaluate :

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

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

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22. Evalute :

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

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

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

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23. simplify : $\tan^{-1}\left(\frac{a\cos x - b\sin x}{b\cos x + a\sin x}\right)\frac{-\pi}{2} < x < \frac{\pi}{2}, \frac{a}{b}\tan x > -1$

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24. Evaluate :

$\tan\left\{\frac{1}{2}\cos^{-1}\frac{\sqrt{5}}{3}\right\}$

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25. Solve : $\tan^{-1}\frac{x-1}{x+1}+\tan^{-1}\frac{2x-1}{2x+1}=\tan^{-1}\frac{23}{36}$

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26. find the values of each of the following :

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

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

$(iii)\cos\left(\sec^{-1}x+\text{cosec}^{-1}x\right),|X|\geq 1$

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27. solve for x : $\tan\left(\cos^{-1}x\right)=\sin\left(\cot^{-1}\frac{1}{2}\right)$

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28. $\tan^{-1}\left(\frac{1}{4}\right)+\tan^{-1}\left(\frac{2}{9}\right)$ is equal to

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

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30. The value of $\sin^{-1}(1)+\cos^{-1}(0)$ is .....

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

B. 0

C. 1

D. π

Answer: D

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

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

B. $6x$

C. $3x$

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

Answer: D

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32. $\tan^{-1} x + \cot^{-1} x = ...$

A. 1

B. $-\pi$

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

D. π

Answer: C

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33. $\sin^{-1} x - \cos^{-1}(-x)$ =.....

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

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

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

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

Answer: A

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34. $\sec^{-1}(\sqrt{2}) + \cot^{-1}(1) = \ldots\ldots\ldots$

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

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

C. π

D. $-\pi$

Answer: B

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

A. $\frac{\sin^{-1}(1)}{\sqrt{2}}$

B. $\sin^{-10\left(\frac{1}{2}\right)}$

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

D. $\tan^{-1}\left(\frac{1}{\sqrt{3}}\right)$

Answer: A

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36. The value of $\cos^{-1}(-1)+\tan^{-1}(\infty)+\sin^{-1}1=\ldots...$

A. $-\pi$

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

C. 30°

D. 2π

Answer: D

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37. The value of $\cos^{-1}(-1) + \sin^{-1} 1 = \ldots\ldots\ldots$

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

B. $-\pi$

C. 2π

D. 3π

Answer: A

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Exercise 4 1

1. Find all the values of x such that

$-10\pi \leq x \leq 10\pi \text{ and } \sin x = 0$

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2. Find the period and amplitude of

$y = -\sin\left(\frac{1}{3}x\right)$

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3. Sketch the graph of $y = \sin\left(\frac{1}{3}x\right)$ for $0 \leq x < 6\pi$.

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4. Find the value of

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

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

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5. For that values of x does $\sin x = \sin^{-1} x$?

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6. Find the domain of the following

$g(x) = 2\sin^{-1}(2x-1) - \frac{\pi}{4}$

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7. Find the value of $\sin^{-1}\left(\sin\frac{5\pi}{9}\cos\frac{\pi}{9} + \cos\frac{5\pi}{9}\sin\frac{\pi}{9}\right)$

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Exercise 4 2

1. Find all values of x such that

$-6\pi \leq x \leq 6\pi \text{ and } \cos x = 0$

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2. State the reason for $\cos^{-1}\left[\cos\left(-\frac{\pi}{6}\right)\right] \neq -\frac{\pi}{6}$

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3. Is $\cos^{-1}(-x) = \pi - \cos^{-1} x$ true ? Justify your answer .

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4. Find the principal angle of ,

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

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5. Find the value of

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

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6. Find the domain of the following functions

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

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7. For what values x, the inequality $\frac{\pi}{2}<\cos^{-1}(3x-1)<\pi$ hold ?

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8. Find the value of

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

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Exercise 4 3

1. Find the domain of the following functions :

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

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2. Simplify $\tan^{-1}\left(\tan.\frac{5\pi}{6}\right)$

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3. Find the value of

$\tan\left(\tan^{-1}(1947)\right)$

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4. Find the value of

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

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Exercise 4 4

1. Find the principal value of

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

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2. Find the value of

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

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Exercise 4 5

1. Find the value, it exists. If not give the reson for non-existence.

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

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2. Find the value of the expression in terms of x, with the help of a reference triangle.

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

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3. Find the value of

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

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4. Prove thate

$$\sin^{-1}\left(\frac{3}{5}\right)-\cos^{-1}\left(\frac{12}{13}\right)=\sin^{-1}\left(\frac{16}{65}\right)$$

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5. Prove that

$$\tan^{-1}x+\tan^{-1}y+\tan^{-1}z=\tan^{-1}\left(\frac{x+y+z-xyz}{1-xy-yz-zx}\right)$$

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6. If $\tan^{-1}x+\tan^{-1}y+\tan^{-1}z=\pi,$ show that x + y + z = xyz.

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

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8. Simplify : $\tan^{-1}\left(\frac{x}{y}\right) - \tan^{-1}\left(\frac{x-y}{x+y}\right)$.

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9. Solve :

$2\tan^{-1}(\cos x) = \tan^{-1}(2\text{cosec} x)$

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10. Find the number of solution of the eqution

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

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Exercise 4 6

1. The value of $\sin^{-1}(\cos x), 0 \leq x \leq \pi$ is :

A. $\pi - x$

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

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

D. $\pi - x$

Answer: C

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

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

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

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

D. π

Answer: B

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3. $\sin^{-1}\frac{3}{5} - \cos^{-1}\frac{12}{13} + \sec^{-1}\frac{5}{3} - \cos ec^{-1}\frac{13}{12}$ is equal to

A. 2π

B. π

C. 0

D. $\tan^{-1}\frac{12}{65}$

Answer: C

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4. If $\sin^{-1} x = 2\sin^{-1} \alpha$ has a solution, then

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

B. $|\alpha| \geq \frac{1}{\sqrt{2}}$

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

D. $|\alpha| > \frac{1}{\sqrt{2}}$

Answer: A

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

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

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

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

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

Answer: B

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6. If $\sin^{-1}x + \sin^{-1}y + \sin^{-1}z = \frac{3\pi}{2}$, the value of $x^{2017} + y^{2018} + z^{2019} - \frac{9}{x^{101} + y^{101} + z^{101}}$ is

A. 0

B. 1

C. 2

D. 3

Answer: A

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7. If $\cot^{-1}x = \frac{2\pi}{7}$ for some $x \in R$ the value of $\tan^{-1}x$ is :

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

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

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

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

Answer: C

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

A. $[1, 2]$

B. $[-1, 1]$

C. $[0, 1]$

D. $[-1, 0]$

Answer: A

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

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

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

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

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

Answer: D

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10. $\tan^{-1}\left(\frac{1}{4}\right) + \tan^{-1}\left(\frac{2}{9}\right)$ is equal to

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

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

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

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

Answer: D

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11. If the function $f(x) = \sin^{-1}(x^2 - 3)$ then x belongs to

A. $[-1, 1]$

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

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

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

Answer: C

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12. If $\cot^{-1} 2$ and $\cot^{-1} 3$ are two anges of a triangle, then the third angle is

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

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

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

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

Answer: B

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13. $\sin^{-1}\left[\tan\frac{\pi}{4}\right] - \sin^{-1}\left[\sqrt{\frac{3}{x}}\right] = \frac{\pi}{6}$. Then x is a root of the equation

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

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

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

D. $x^2 + x + 6 = 0$

Answer: B

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

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

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

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

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

Answer: A

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15. If $\cot^{-1}\left(\sqrt{\sin\alpha}\right) + \tan^{-1}\left(\sqrt{\sin\alpha}\right) = u$, then $\cos 2u$ is equal to

A. $\tan^2 \alpha$

B. 0

C. -1

D. $\tan 2\alpha$

Answer: C

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

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

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

C. 0

D. π

Answer: C

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17. The equation $\tan^{-1} x - \cot^{-1} x = \tan^{-1}\left(\frac{1}{\sqrt{3}}\right)$ has

A. no solution

B. unique solution

C. two solutions

D. infinite number of solutions

Answer: B

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18. If $\cos^{-1} x + \cot^{-1}\left(\frac{1}{2}\right) = \frac{\pi}{2}$ then x is equal to

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

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

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

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

Answer: B

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

A. 4

B. 5

C. 2

D. 3

Answer: D

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20. $\sin\left(\tan^{-1} x\right) |x| < 1$ is equal to

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

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

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

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

Answer: D

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