



MATHS

BOOKS - VK JAISWAL MATHS (HINGLISH)

INVERSE TRIGONOMETRIC FUNTIONS

Exercise 1 Single Choice Problems

1. If $\sin^{-1} x \in \left(0, \frac{\pi}{2}\right)$, then the value of $\tan\left(\frac{\cos^{-1}(\sin(\cos^{-1} x)) + \sin^{-1}(\cos(\sin^{-1} x))}{2}\right)$ is :

A. 1

B. 2

C. 3

D. 4

Answer: A



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

A. 14

B. 15

C. 16

D. 17

Answer: B



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4. Sum the series :

$$\tan^{-1}\left(\frac{4}{1+3.4}\right) + \tan^{-1}\left(\frac{6}{1+8.9}\right) + \tan^{-1}\left(\frac{8}{1+15.16}\right) + \dots$$

is :

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

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

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

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

Answer: A



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5. If $\cot^{-1}(\sqrt{\cos \alpha}) - \tan^{-1}(\sqrt{\cos \alpha}) = x$, then $\sin x$ is $\frac{\tan^2 \alpha}{2}$ (b) $\frac{\cot^2 \alpha}{2}$ (c) $\tan^2 \alpha$ (d) $\frac{\cot \alpha}{2}$

A. $\tan^2\left(\frac{\alpha}{2}\right)$

B. $\cot^2\left(\frac{\alpha}{2}\right)$

C. $\tan \alpha$

D. $\cot\left(\frac{\alpha}{2}\right)$

Answer: A



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6. The sum of $\cot^{-1}\left(\frac{7}{4}\right) + \cot^{-1}\left(\frac{19}{4}\right) + \cot^{-1}\left(\frac{39}{4}\right) + \cot^{-1}\left(\frac{67}{4}\right) \dots \dots \infty$ is

equal to :

A. $\frac{\pi}{4} - \cot^{-1}(3)$

B. $\frac{\pi}{4} - \tan^{-1}(3)$

C. $\frac{\pi}{4} + \cot^{-1}(3)$

D. $\frac{\pi}{4} + \tan^{-1}(3)$

Answer: C



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7. Find the number of solutions of the equation

$$\cos^{-1}(1-x) + m \cos^{-1} x = \frac{n\pi}{2}, \text{ where } m > 0, n \leq 0.$$

A. 0

B. 1

C. 2

D. none of these

Answer: A



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

:

A. 1

B. 2

C. 3

D. infinitely many

Answer: A



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9. $\sin^{-1}\left(\frac{x^2}{4} + \frac{y^2}{9}\right) + \cos^{-1}\left(\frac{x}{2\sqrt{2}} + \frac{y}{3\sqrt{2}} - 2\right)$

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

B. π

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

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

Answer: D



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10. Solution set of inequation

$$(\cos^{-1} x)^2 - (\sin^{-1} x)^2 > 0 \text{ is}$$

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

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

C. $(-1, 1)$

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

Answer: B



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11. Let α, β are the roots of the equation $x^2 + 7x + k(k - 3) = 0$, where $k \in (0, 3)$ and k is a constant. Then the value of $\tan^{-1} \alpha + \tan^{-1} \beta + \tan^{-1} \frac{1}{\alpha} + \tan^{-1} \frac{1}{\beta}$ is :

A. π

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

C. 0

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

Answer: C



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12. Let $f(x) = a + 2b \cos^{-1} x$, $b > 0$. If domain and range of $f(x)$ are the same set, then $(b - a)$ is equal to :

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

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

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

D. $1 + \frac{1}{\pi}$

Answer: D

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

A. -1

B. 4

C. 5

D. 6

Answer: A

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14. The total number of ordered pairs (x, y) satisfying

$|y| = \cos x$ and $y = \sin^{-1}(\sin x)$, where $x \in [-2\pi, 3\pi]$ is equal to :

A. 2

B. 4

C. 5

D. 6

Answer: C



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15. If $[\sin^{-1}(\cos^{-1}(\tan^{-1} x))] = 1$ where $[.]$ denotes integer

function, then complete set of values of x is :

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

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

C. $[\tan(\cos(\sin 1)), \tan(\sin(\cos(\sin 1)))]$

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

Answer: B



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16. The number of ordered pair(s) (x, y) of real numbers satisfying the equation $1 + x^2 + 2x \sin(\cos^{-1} y) = 0$, is :

A. 0

B. 1

C. 2

D. 3

Answer: B



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

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

B. π

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

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

Answer: B



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18. The complete set of values of x for which

$2 \tan^{-1} x + \cos^{-1} \left(\frac{1 - x^2}{1 + x^2} \right)$ is independent of x is :

A. $(-\infty, 0]$

B. $[0, \infty)$

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

D. $[1, \infty)$

Answer: A



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19. The number of ordered pair(s) (x,y) which satisfy $y = \tan^{-1} \tan x$ and

$$16(x^2 + y^2) - 48\pi x + 16\pi y + 31\pi^2 = 0$$
 is

A. 0

B. 1

C. 2

D. 3

Answer: D



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20. Domain (D) and range (R) of $f(x) = \sin^{-1}(\cos^{-1}[x])$ where $[\]$ denotes the greatest integer function is

A. $D \equiv [1, 2), R \equiv \{0\}$

B. $D \equiv [0, 1), R \equiv \{-1, 0, 1\}$

C. $D \equiv [-1, 1), R \equiv \left\{0, \frac{\pi}{2}, \pi\right\}$

D. $D \equiv [-1, 1], R \equiv \left\{-\frac{\pi}{2}, 0, \frac{\pi}{2}\right\}$

Answer: A

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21. If $2 \sin^{-1} x + \{\cos^{-1} x\} > \frac{\pi}{2} + \{\sin^{-1} x\}$, then $x \in :$ (where $\{\cdot\}$ denotes fractional part function)

A. $(\cos 1, 1]$

B. $(\sin 1, 1]$

C. $(\sin 1, 1]$

D. none of these

Answer: B

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

A. 2

B. 3

C. 4

D. 1

Answer: A

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23. The number of real values of x satisfying the equation $3 \sin^{-1} x + \pi x - \pi = 0$ is/are :

A. 0

B. 1

C. 2

D. -3

Answer: B



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24. Range of $f(x) = \sin^{-1} x + x^2 + 4x + 1$ is :

A. $\left[-\frac{\pi}{2} - 2, \frac{\pi}{2} + 6 \right]$

B. $\left[0, \frac{\pi}{2} + 6 \right]$

C. $\left[-\frac{\pi}{2} - 2, \infty \right)$

D. $(-3, \infty)$

Answer: A



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25. The solution set of the inequality $(\operatorname{cosec}^{-1}x)^2 - 2\operatorname{cosec}^{-1}x \geq \frac{\pi}{6}(\operatorname{cosec}^{-1}x - 2)$ is $(-\infty, a] \cup [b, \infty)$, then $(a + b)$ equals

A. 0

B. 1

C. 2

D. -3

Answer: B



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26. Number of solution of the equation $2\sin^{-1}(x + 2) = \cos^{-1}(x + 3)$

is :

A. 0

B. 1

C. 2

D. None of these

Answer: B



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27. Find the sum series:

$$\tan^{-1}\left(\frac{1}{3}\right) + \tan^{-1}\left(\frac{1}{7}\right) + \tan^{-1}\left(\frac{1}{13}\right) + \dots \rightarrow \infty$$

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

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

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

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

Answer: A



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28. If $\tan^{-1} \frac{1}{4} + \tan^{-1} \frac{2}{9} = \frac{1}{2} \cos^{-1} x$ then x is equal to

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

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

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

D. none of these

Answer: C



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

A. $(-1, 1)$

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

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

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

Answer: D



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30. The sum of the series $\cot^{-1}\left(\frac{9}{2}\right) + \cot^{-1}\left(\frac{33}{4}\right) + \cot^{-1}\left(\frac{129}{8}\right) + \dots \dots \infty$ is equal to :

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

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

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

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

Answer: A



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31. If $\int \frac{\ln(\cot x)}{\sin x \cos x} dx = \frac{1}{k} \ln^2(\cot x) + C$

(where C is a constant), then the value of k is :

A. 1

B. 2

C. 3

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

Answer: B



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32. The number of solutions of $\sin^{-1} x + \sin^{-1}(1+x) = \cos^{-1} x$ is/are

:

A. 0

B. 1

C. 2

D. infinite

Answer: B



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33. The value of x satisfying the equation

$$(\sin^{-1} x)^3 - (\cos^{-1} x)^3 + (\sin^{-1} x)(\cos^{-1} x)(\sin^{-1} x - \cos^{-1} x) = \frac{\pi^3}{16}$$

is :

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

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

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

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

Answer: C



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34. The complete solution set of the equation

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

A. $\left[2 - \frac{\pi^2}{4}, 1\right]$

B. $\left[1 - \frac{\pi^2}{4}, 1\right]$

C. $\left[2 - \frac{\pi^2}{4}, 0\right]$

D. $[-1, 1]$

Answer: A



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35. Let $f(x) = \tan^{-1}\left(\frac{\sqrt{1+x^2}-1}{x}\right)$ then which of the following is correct :

A. $f(x)$ has only one integer in its range

B. Range of $f(x)$ is $\left(-\frac{\pi}{4}, \frac{\pi}{4}\right) - \{0\}$

C. Range of $f(x)$ is $\left(-\frac{\pi}{2}, \frac{\pi}{2}\right) - \{0\}$

D. Range of $f(x)$ is $\left[-\frac{\pi}{4}, \frac{\pi}{4}\right] - \{0\}$

Answer: B



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36. If $\tan^{-1} \frac{1}{4} + \tan^{-1} \frac{2}{9} = \frac{1}{2} \cos^{-1} x$ then x is equal to

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

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

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

D. None of these

Answer: C



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

A. $(-1, 1)$

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

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

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

Answer: D



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38. The sum of the series

$$\cot^{-1}\left(\frac{9}{2}\right) + \cot^{-1}\left(\frac{33}{4}\right) + \cot^{-1}\left(\frac{129}{8}\right) + \dots \infty \text{ is equal to :}$$

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

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

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

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

Answer: A



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39. The number of real values of x satisfying

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

A. 0

B. 1

C. 2

D. infinitely many

Answer: A



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40. Number of integral values of λ such that the equation

$$\cos^{-1} x + \cot^{-1} x = \lambda \text{ possesses solution is :}$$

A. 2

B. 8

C. 5

D. 10

Answer: C



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41. If the equation $x^3 + bx^2 + cx + 1 = 0$, (b

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

B. $-\pi$

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

D. π

Answer: B



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42. Range of the function $f(x) = \cot^{-1}\{-x\} + \sin^{-1}\{x\} + \cos^{-1}\{x\}$,

where $\{\cdot\}$ denotes fractional part function

A. $\left(\frac{3\pi}{4}, \pi\right)$

B. $\left[\frac{3\pi}{4}, \pi\right)$

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

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

Answer: D



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43. If $3 \leq a < 4$ then the value of $\sin^{-1}(\sin[a]) + \tan^{-1}(\tan[a]) + \sec^{-1}(\sec[a])$, where $[x]$ denotes greatest integer function less than or equal to x , is equal to :

A. 3

B. $2\pi - 9$

C. $2\pi - 3$

D. $9 - 2\pi$

Answer: A



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44. The number of real solutions of $y + y^2 = \sin x$ and $y + y^3 = \cos^{-1} \cos x$ is/are

A. 0

B. 1

C. 3

D. Infinite

Answer: D



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45. Range of $f(x) = \sin^{-1}[x - 1] + 2 \cos^{-1}[x - 2]$ ([.] denotes greatest integer function)

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

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

C. $\left\{ \frac{\pi}{4}, \frac{\pi}{2} \right\}$

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

Answer: D



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Exercise 2 One Or More Than One Answer Is Are Correct

1. $f(x) = \sin^{-1}(\sin x)$, $g(x) = \cos^{-1}(\cos x)$, then :

A. $f(x) = g(x)$ if $x \in \left(0, \frac{\pi}{4}\right)$

B. $f(x) < g(x)$ if $x \in \left(\frac{\pi}{2}, \frac{3\pi}{4}\right)$

C. $f(x) < g(x)$ if $\left(\pi, \frac{5\pi}{4}\right)$

D. $f(x) > g(x)$ if $x \in \left(\pi, \frac{5\pi}{4}\right)$

Answer: A::B::C



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2. The solution(s) of the equation $\cos^{-1} x = \tan^{-1} x$ satisfy

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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3. If the numerical value of $\tan\left(\cos^{-1}\left(\frac{4}{5}\right) + \tan^{-1}\left(\frac{2}{3}\right)\right)$ is $\left(\frac{a}{b}\right)$, where a, b are two positive integers and their H.C.F. is 1

A. $a + b = 23$

B. $a - b = 11$

C. $3b = a + 1$

D. $2a = 3b$

Answer: A::B::C



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4. A solution of the equation

$$\cot^{-1} 2 = \cot^{-1} x + \cot^{-1}(10 - x) \text{ where } 1 < x < 9 \text{ is :}$$

A. 7

B. 3

C. 2

D. 5

Answer: A::B

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5. Consider the equation $\sin^{-1}\left(x^2 - 6x + \frac{17}{2}\right) + \cos^{-1} k = \frac{\pi}{2}$, then :

A. the largest value of k for which equation has 2 distinct solution is 1

B. the equation must have real root if $k \in \left(-\frac{1}{2}, 1\right)$

C. the equation must have real root if $k \in \left(-1, \frac{1}{2}\right)$

D. the equation has unique solution if $k = -\frac{1}{2}$

Answer: A::B::D

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6. The value of x satisfying the equation

$$(\sin^{-1} x)^3 - (\cos^{-1} x)^3 + (\sin^{-1} x)(\cos^{-1} x)(\sin^{-1} x - \cos^{-1} x) = \frac{\pi^3}{16}$$

is :

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

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

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

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

Answer: A::B::D



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Exercise 3 Comprehension Type Problems

1. Let $\cos^{-1}(4x^3 - 3x) = a + b \cos^{-1} x$

Q. If $x \in \left[-\frac{1}{2}, \frac{1}{2}\right]$, then $\sin^{-1}\left(\sin \frac{a}{b}\right)$ is :

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

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

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

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

Answer: A



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2. Let $\cos^{-1}(4x^3 - 3x) = a + b \cos^{-1} x$

If $x \in \left(\frac{1}{2}, 1\right]$, then the value of $\lim_{y \rightarrow a} b \cos(y)$ is

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

B. -3

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

D. 3

Answer: D



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Exercise 4 Matching Type Problems

Column-I		Column-II	
(A)	$\sin^{-1} \frac{4}{5} + 2 \tan^{-1} \frac{1}{3} =$	(P)	$\frac{\pi}{6}$
(B)	$\sin^{-1} \frac{12}{13} + \cos^{-1} \frac{4}{5} + \tan^{-1} \frac{63}{16} =$	(Q)	$\frac{\pi}{2}$
(C)	If $A = \tan^{-1} \frac{x\sqrt{3}}{2\lambda - x}$, $B = \tan^{-1} \left(\frac{2x - \lambda}{\lambda\sqrt{3}} \right)$ then $A - B$ can be equal to	(R)	$\frac{\pi}{4}$
(D)	$\tan^{-1} \frac{1}{7} + 2 \tan^{-1} \frac{1}{3} =$	(S)	π
		(T)	$\frac{\pi}{3}$

1.



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Column-I		Column-II	
(P)	If $f(x) = \sin^{-1} x$ and $\lim_{x \rightarrow \frac{1}{2}} f(3x - 4x^3)$ $= I - 3 \left(\lim_{x \rightarrow \frac{1}{2}} f(x) \right)$ then $[I] =$ ($[\cdot]$ denotes greatest integer function)	(P)	3
(Q)	If $x > 1$, then the value of $\sin\left(\frac{1}{2} \tan^{-1} \frac{2x}{1-x^2} - \tan^{-1} x\right)$ is	(Q)	-1
(R)	Number of values of x satisfying $\sin^{-1} x - \cos^{-1} x = \sin^{-1}(3x - 2)$	(R)	2
(S)	The value of $\sin\left(\tan^{-1} 3 + \tan^{-1} \frac{1}{3}\right)$	(S)	1

2.

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Column-I		Column-II	
(A)	If the first term of an arithmetic progression is 1, its second term is n , and the sum of the first n terms is $39n$	(P)	3
(B)	If the equation $\cos^{-1} x + \cot^{-1} x = k$ possess solution, then the largest integral value of k is	(Q)	4
(C)	The number of solution of equation $\cos \theta = 1 + \sin \theta $ in interval $[0, 3\pi]$, is	(R)	5
(D)	If the quadratic equation $x^2 - x - a = 0$ has integral roots where $a \in \mathbb{N}$ and $4 \leq a \leq 40$, then the number of possible values of a is	(S)	9

3.

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Column-I		Column-II	
(A)	The value of $\tan^{-1}([\pi]) + \tan^{-1}([-\pi] + 1) =$ ([] denotes greatest integer function)	(P)	2
(B)	The number of solutions of the equation $\tan x + \sec x = 2 \cos x$ in the interval $[0, 2\pi]$ is	(Q)	3
(C)	The number of roots of the equation $x + 2 \tan x = \frac{\pi}{2}$ in the interval $[0, 2\pi]$ is	(R)	0
(D)	The number of solutions of the equation $x^3 + x^2 + 4x + 2 \sin x = 0$ in the interval $[0, 2\pi]$ is	(S)	1

4.



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Exercise 5 Subjective Type Problems

1. The complete set of values of x satisfying the inequality $\sin^{-1}(\sin 5) > x^2 - 4x$ is $(2 - \sqrt{\lambda - 2\pi}, 2 + \sqrt{\lambda - 2\pi})$, then $\lambda =$



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2. In a ΔABC , if $(II_1)^2 + (I_2I_3)^2 = \lambda R^2$, where I denotes incentre, I_1, I_2 and I_3 denote centres of the circles escribed to the sides BC, CA

and AB respectively and R be the radius of the circum circle of $\triangle ABC$.

Find λ .

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3. If $2\tan^{-1}\frac{1}{5} - \sin^{-1}\frac{3}{5} = -\cos^{-1}\frac{63}{\lambda}$, then $\lambda =$

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4. If $2\tan^{-1}\frac{1}{5} - \sin^{-1}\frac{3}{5} = -\cos^{-1}\frac{9\lambda}{65}$, then $\lambda =$

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5. 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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6. Find number of solutions of the equation $\sin^{-1}\left(\left|\log_6^2(\cos x) - 1\right|\right) + \cos^{-1}\left(\left|3\log_6^2(\cos x) - 7\right|\right) = \frac{\pi}{2}$, if $x \in [0, 4\pi]$.



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