MATHS

BOOKS - MTG WBJEE MATHS (HINGLISH)

INVERSE TRIGONOMETRIC FUNCTIONS

Wb Jee Workout Category 1 Single Option Correct Type 1 Mark

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

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

B. $\sqrt{24/25}$

C. $-1/5$

D. $1/5$

Answer: C

2. If $0 \le x \le 1$ and $\theta - \sin^{-1} x + \cos^{-1} x - \tan^{-1} x$, then

A. $\theta \le \pi/2$

B. $\theta \ge \pi/4$

C. $\theta = \pi/4$

D. $\pi/4 \le \theta \le \pi/2$

Answer: D

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

A. $-\pi/4$

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

C. $3\pi/4$

D. None of these

Answer: C

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4. The principal value of $\sin^{-1}\left(-\sqrt{3}/2\right) + \cos^{-1}(\cos(7\pi/6))$ is

A. $5\pi/6$

B. $\pi/2$

C. $3\pi/2$

D. None of these

Answer: B

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5. The value of

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

to

A. $7\pi/4$

B. $13\pi/4$

C. $\pi/12$

D. $25\pi/12$

Answer: B

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6. If $\cos ec^{-1}x = 2\cot^{-1}7 + \cos^{-1}\left(\frac{3}{5}\right)$, then x=

A. $44/117$

B. $125/117$

C. $24/7$

D. $5/3$

Answer: B

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7. $\sec^2\left(\tan^{-1}2\right) + \csc^2\left(\cot^{-1}3\right) =$

A. 1

B. 5

C. 10

D. 15

Answer: D

8. If $u = \cot^{-1}\sqrt{\tan\alpha} - \tan^{-1}\sqrt{\tan\alpha}$, then $\tan\left(\dfrac{\pi}{4} - \dfrac{u}{2}\right)$ is equal to

(a) $\sqrt{\tan\alpha}$ (b) $\sqrt{\cos\alpha}$ (c) $\tan\alpha$ (d) $\cot\alpha$

A. $\sqrt{\tan\alpha}$

B. $\sqrt{\cot\alpha}$

C. $\tan\alpha$

D. $\cot\alpha$

Answer: A

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9. If $\tan^{-1}y = 4\tan^{-1}x$, then $1/y$ is zero for

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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10. 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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11. If $\sin^{-1}(\tan \pi/4) - \sin^{-1}\left(\sqrt{3/x}\right) - \pi/6 = 0$, 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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12. The root of the equation

$$\tan^{-1}\left(\frac{x+1}{x-1}\right) + \tan^{-1}\left(\frac{x-1}{x}\right) = \pi - \tan^{-1}7 \text{ is}$$

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

B. 1

C. 2

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

Answer: C

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

A. 1

B. x

C. $\dfrac{1}{x}$

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

Answer: A

14. If $\sin^{-1}\cdot\dfrac{x}{5} + \cos ec^{-1}\cdot\left(\dfrac{5}{3}\right) = \dfrac{\pi}{2}$, then $x =$

A. 3

B. 4

C. 5

D. 1

Answer: B

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15. The number of roots of $\cos^{-1} x + \cos^{-1} 2x = \dfrac{\pi}{2}$ is

A. 0

B. 1

C. 2

D. > 2

Answer: B

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Wb Jee Workout Category 2 Single Option Correct Type 2 Marks

1. $\theta = \tan^{-1}\left(2\tan^2\theta\right) - \tan^{-1}\left((1/3)\tan\theta\right)$, if $\tan\theta$ is equal to

    A. -2

    B. -1

    C. $2/3$

    D. 2

Answer: A

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2. If $\dfrac{\tan^{-1}\left(\sqrt{1+x^2}-1\right)}{x} = 4^0$ then $x = \tan 2^0$ (b) $x = \tan 4^0$ $x = \dfrac{\tan 1}{4^0}$ (d) $x = \tan 8^0$

    A. $\tan 2$

    B. $\tan 4$

    C. $\tan(1/4)$

D. $\tan 8$

3. The equation $2\cos^{-1}x = \sin^{-1}\left(2x\sqrt{1-x^2}\right)$ is valid for all values of

x satisfying

A. $-1 \leq x \leq 1$

B. $0 \leq x \leq 1$

C. $0 \leq x \leq 1/\sqrt{2}$

D. $1/\sqrt{2} \leq x \leq 1$

4. If $A = \tan^{-1}(1/7), B = \tan^{-1}(1/3),$ then

A. $\cos 2A = \sin 2A$

B. $\cos 2A = \sin 2B$

C. $\cos 2A = \cos 2B$

D. $\cos 2A = \sin 4B$

Answer: D

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

A. x

B. x^2

C. $1/x$

D. $1/x^2$

Answer: B

6.

if

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

then find the value of θ

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

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

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

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

Answer: C

7. If $\sin^{-1}x + \cos^{-1}(1-x) = \sin^{-1}(-x)$, then x satisfies the equation

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

B. $2x^2 - 3x = 0$

C. $2x^2 + x - 1 = 0$

D. None of these

Answer: B

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8. If a, b, c be positive real numbers and the value of

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

then $\tan\theta$ is equal to

A. 0

B. 1

C. $\sqrt{\dfrac{b+c}{ac}}$

D. $\sqrt{\dfrac{a+b+c}{ab}}$

Answer: A

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

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

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

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

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

Answer: D

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10. If

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

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

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

B. 1

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

D. -1

Answer: B

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Wb Jee Workout Category 3 One Or More Than One Option Correct Type 2 Marks

1. The equation $3\cos^{-1}x - \pi x - \dfrac{\pi}{2} = 0$ has

A. one solution

B. one and only one solution

C. no solution

D. more than one solution

Answer: B

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2. If $\alpha \le \sin^{-1} x + \cos^{-1} x - \tan^{-1} x \le \beta$, then

A. $\alpha = -\pi/4$

B. $\beta = 3\pi/4$

C. $[\alpha] = 0$, where $[\cdot]$ denotes greatest integer function.

D. $[\alpha - \beta] = -2$, where $[\cdot]$ denotes greatest integer function.

Answer: B::C::D

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3. $\cos^{-1}\sqrt{\dfrac{a-x}{a-b}} = \sin^{-1}\sqrt{\dfrac{x-b}{a-b}}$ is possible ,if

A. $a > x > b$

B. $a < x < b$

C. $a = x = b$

D. $a > b$ and x, takes any value

Answer: A::B

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4. Let $\tan^{-1}\left(\tan.\dfrac{5\pi}{4}\right) = \alpha$, $\tan^{-1}\left(-\tan.\dfrac{2\pi}{3}\right) = \beta$, then

A. $\alpha > \beta$

B. $4\alpha - 3\beta = 0$

C. $\alpha + \beta = \dfrac{7\pi}{12}$

D. None of these

Answer: B::C

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5. Sum of series

$$\sum_{r=1}^{n} \sin^{-1}\left[\frac{2r + 1}{r(r + 1)\left(\sqrt{r^2 + 2r} + \sqrt{r^2 - 1}\right)}\right]$$

A. $\dfrac{\pi}{2} - \sin^{-1}\left(\dfrac{1}{n + 1}\right)$

B. $\cos^{-1}\left(\dfrac{1}{n + 1}\right)$

C. $\dfrac{\pi}{2} - \cos^{-1}\left(\dfrac{1}{n + 1}\right)$

D. None of these

Answer: A::B

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6. Let $f(x) = e^{\cos^{-1}\sin\left(x + \frac{\pi}{3}\right)}$, then

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

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

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

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

Answer: B::C

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7.   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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8. If   m   and   M   are   the   least   and   the   greatest   value   of $\left(\cos^{-1} x\right)^2 + \left(\sin^{-1} x\right)^2$, then $\dfrac{M}{m}$ is equal to

A. 10

B. 5

C. 4

D. 2

Answer: A

9. If $\sin^{-1}\left(\dfrac{3\sin 2\theta}{5 + 4\cos 2\theta}\right) = 2\tan^{-1}x$, then $x =$

A. $\tan 3\theta$

B. $3\tan\theta$

C. $\dfrac{1}{3}\tan\theta$

D. $3\cot\theta$

Answer: C

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10. The sum of the infinite series

$\cot^{-1}2 + \cot^{-1}8 + \cot^{-1}18 + \cot^{-1}32 + \ldots$ is equal to

A. $\pi/3$

B. $\pi/4$

C. $\pi/6$

D. $\pi/8$

Answer: B

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1. If $\sin^{-1}\left(\dfrac{x}{13}\right) + \cos ec^{-1}\left(\dfrac{13}{12}\right) = \dfrac{\pi}{2}$, then the value of x is

A. 5

B. 4

C. 12

D. 11

Answer: A

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2. If $\sin^{-1}\left(x - \dfrac{x^2}{2} + \dfrac{x^3}{4} + \dfrac{x^4}{8} + \ldots\right) = \dfrac{\pi}{6}, where |x| < 2$ then the value of x is (A) $\dfrac{2}{3}$ (B) $\dfrac{3}{2}$ (C) $-\dfrac{2}{3}$ (D) $-\dfrac{3}{2}$

A. $2/3$

B. $3/2$

C. $-2/3$

D. $-3/2$

Answer: A

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

A. $-\dfrac{\pi}{8}$

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

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

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

Answer: D

4. The trigonometric equation $\sin^{-1} x = 2\sin^{-1} 2a$ has a real solution, if

A. $|a| > \dfrac{1}{\sqrt{2}}$

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

C. $|a| > \dfrac{1}{2\sqrt{2}}$

D. $|a| \le \dfrac{1}{2\sqrt{2}}$

Answer: D

5. The possible values of x, which satisfy the trigonometric equation $\tan^{-1}\left(\dfrac{x-1}{x-2}\right) + \tan^{-1}\left(\dfrac{x+1}{x+2}\right) = \dfrac{\pi}{4}$ are

A. $\pm\dfrac{1}{\sqrt{2}}$

B. $\pm\sqrt{2}$

C. $\pm\dfrac{1}{2}$

D. ± 2

Answer: A

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6. Find the value of

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

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

B. π

C. 0

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

Answer: B

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