MATHS

BOOKS - BETTER CHOICE PUBLICATION

INVERSE TRIGONOMETRIC FUNCTIONS

Solved Examples Section I Mcq

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

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

B. π

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

D. $-\pi$

Answer: A

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

A. 1

B. 0

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

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

Answer: B

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3. $\cos^{-1}\left(\cos\frac{7\pi}{6}\right)$ is equal to

A. $\frac{7\pi}{6}$

B. $\frac{5\pi}{6}$

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

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

Answer: B

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4. $\tan^{-1}\sqrt{3} - \cot^{-1}(-\sqrt{3})$ is equal to

A. π

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

C. 0

D. $2\sqrt{3}$

Answer: B

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5. Domain of the function $f(x) = \sin^{-1} x$ is equal to

A. $[0, 1]$

B. R

C. $[-1, 1]$

D. none of these

Answer: C

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6. $\sin^{-1}\left(\frac{1}{5}\right) + \cos^{-} x = \frac{\pi}{2}$, then value of x equals

A. $\frac{1}{4}$

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

C. $\frac{1}{9}$

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

Answer: B

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7. The value of $\sin\left(\frac{\pi}{3} - \sin^{-1}\left(-\frac{1}{2}\right)\right)$ is

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

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

C. $\frac{1}{4}$

D. 1

Answer: D

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8. The value of $\cot\left(\sin^{-1} x\right)$ is

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

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

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

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

Answer: D

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Solved Examples Short Answer Type Questions Section Ii

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

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2. Find the principal value of $\cos ec^{-1}(2)$

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

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

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

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

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

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8. Find the value of $\cos^{-1}\left(\cos\frac{13\pi}{6}\right)$

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Solved Examples Section Iii

1. prove that $3\sin^{-1}x = \sin^{-1}\left(3x - 4x^3\right), x \in \left[\frac{-1}{2}, \frac{1}{2}\right]$.

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2. Prove that $\tan^{-1}\frac{2}{11} + \tan^{-1}\frac{7}{24} = \tan^{-1}\frac{1}{2}$.

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3. Prove that $\tan^{-1}\frac{1}{2} + \tan^{-1}\frac{2}{11} = \frac{1}{2}\sin^{-1}\frac{24}{25}$

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

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5. Prove that $2\tan^{-1}\frac{1}{2}+\tan^{-1}\frac{1}{7}=\tan^{-1}\frac{31}{17}$

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6. Prove that $\tan^{-1}\frac{1}{5}+\tan^{-1}\frac{1}{7}+\tan^{-1}\frac{1}{3}+\tan^{-1}\frac{1}{8}=\frac{\pi}{4}$

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7. Prove that :

$$\cos^{-1}\left(\frac{4}{5}\right)+\cos^{-1}\left(\frac{12}{13}\right)=\cos^{-1}\left(\frac{33}{65}\right)$$

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8. Prove that

$$\tan^{-1}\frac{63}{16}=\sin^{-1}\frac{5}{13}+\cos^{-1}\frac{3}{5}$$

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9. Show that $\sin^{-1}\frac{3}{5}-\sin^{-1}\frac{8}{17}=\cos^{-1}\frac{84}{85}$

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Solved Examples Section Iv

1. Solve :

$$\tan^{-1}(x+2)+\tan^{-1}(x-2)=\tan^{-1}\frac{4}{19}, x>0$$

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2. If $\tan^{-1}\left(\frac{x-1}{x-2}\right)+\tan^{-1}\left(\frac{x+1}{x+2}\right)=\frac{\pi}{4}$, then find the value of x

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3. Solve the equation

$$\tan^{-1} 2x + \tan^{-1} 3x = \frac{\pi}{4}, x > 0$$

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4. Solve the Equation :

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

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5. If $\cos\left(\sin^{-1}\frac{2}{3} + \cos^{-1} x\right) = 0$, then find the value of x.

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6. Solve the equation

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

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Solved Examples Section V

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

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2. Prove that :

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

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3. Write $\tan^{-1}\left(\frac{x}{\sqrt{a^2-x^2}}\right)$ in simplest form.

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4. Write $\tan^{-1}\left(\frac{\sqrt{1+x^2}-1}{x}\right), x\neq 0$ simplest form.

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Assignment Most Important Questions For Practice Section I Mcq

1. Principal value of $\sin^{-1}\left(-\frac{1}{2}\right)+\cos^{-1}\left(-\frac{1}{2}\right)$ is (a) $\frac{\pi}{2}$ (b) $-\frac{\pi}{2}$ (c) $\frac{3\pi}{2}$ (d)none of these

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

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

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

D. none of these

Answer: A

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2. The principal value of $\tan^{-1}\left(\tan\frac{2\pi}{3}\right)$ is

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

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

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

D. none of these

Answer: B

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3. $\tan^{-1}\left(\frac{x}{y}\right) - \tan^{-1}\left(\frac{x-y}{x+y}\right)$ is equal to :

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

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

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

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

Answer: C

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4. The value of $\sin^{-1}\left(\cos\frac{43\pi}{5}\right)$ is

A. $\frac{3\pi}{5}$

B. $\frac{-7\pi}{5}$

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

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

Answer: D

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5. $\sin\left(\tan^{-1} x\right), |x| < 1$ 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:

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Assignment Most Important Questions For Practice Section Ii Short Answer Type Questions

1. Find the principal value of following

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

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2. Find the principal value of following

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

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3. Find the principal value of following

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

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4. Find the principal value of following

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

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5. Find the principal value of following

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

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6. Find the principal value of following

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

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7. Find the value of following

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

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8. Find the value of following

$$\tan^{-1}\left(\tan\frac{9\pi}{8}\right)$$

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9. Find the value of the following: $\tan^{-1}\left(\tan\left(7\frac{\pi}{6}\right)\right)$

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10. Find the value of following

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

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11. Using principal values, find the value of following

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

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12. Using principal values, find the value of following

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

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13. Using principal values, find the value of following

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

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Assignment Most Important Questions For Practice Section Iii

1. Prove that

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

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2. Prove that

$$\tan^{-1}\frac{1}{2}+\tan^{-1}\frac{2}{11}=\tan^{-1}\frac{3}{4}$$

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3. Prove that

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

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4. Prove that

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

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5. Prove that

$$2\tan^{-1}\frac{3}{4}-\tan^{-1}\frac{17}{31}=\frac{\pi}{4}$$

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6. Prove that

$$2\tan^{-1}\frac{1}{5}+\tan^{-1}\frac{1}{4}=\tan^{-1}\frac{32}{43}$$

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7. Prove that

$$\cos^{-1}\frac{12}{13}+\cos^{-1}\frac{4}{3}=\tan^{-1}\frac{56}{33}$$

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8. Prove that

$$\sin^{-1}\frac{5}{13}+\cos^{-1}\frac{3}{5}=\sin^{-1}\frac{63}{65}$$

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9. Prove that

$$\sin^{-1}\frac{8}{17}+\sin^{-1}\frac{3}{5}=\tan^{-1}\frac{77}{36}$$

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10. Prove that

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

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Assignment Most Important Questions For Practice Section Iv

1. Solve the following equations

$$\tan^{-1}(x+2) + \tan^{-1}(x-2) = \tan^{-1}\frac{8}{79}$$

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2. Solve the following equations

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

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3. Solve the following equations

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

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4. Solve the following equations

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

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5. Solve the following equations

$$\cos^{-1} x + \sin^{-1} \frac{x}{2} = \frac{\pi}{6}$$

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6. Solve the following equations

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

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7. Solve the following equations

$$\tan^{-1}\frac{x}{2}+\tan^{-1}\frac{x}{3}=\frac{\pi}{4},\sqrt{6}>x>0$$

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Assignment Most Important Questions For Practice Section V

1. Prove that

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

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2. Prove that

$$\cot^{-1}\left(\frac{\sqrt{1+x}-\sqrt{1-x}}{\sqrt{1+x}+\sqrt{1-x}}\right)=\frac{\pi}{4}+\frac{1}{2}\cos^{-1}x$$

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3. Write the following in the simplest form

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

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4. Write the following in the simplest form

$$\cot^{-1}\left(\sqrt{1+x^2}-x\right)$$

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5. Write the following in the simplest form

$$\cot^{-1}\left(\sqrt{1+x^2}+x\right)$$

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6. Write the following in the simplest form

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

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7. Write the following function in the simplest form :

$$\tan^{-1}\left(\frac{1}{\sqrt{x^2-1}}\right), |x| > 1$$

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8. Write the following in the simplest form

$$\cot^{-1}\left(\frac{1}{\sqrt{x^2-1}}\right)$$

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Previous Years Board S Questions For Practice Mcq

1. The value of $\tan^{-1} x + \cot^{-1} x$ is

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

B. π

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

D. $-\pi$

Answer: A

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2. The value of $\sec^{-1} x + \cos ec^{-1} x$ is

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

B. π

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

D. $-\pi$

Answer: A

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3. The value of $\cot\left(\tan^{-1}x+\cot^{-1}x\right)$ is equal to :

A. 1

B. 0

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

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

Answer: B

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4. The value of $\cos ec\left(\sec^{-1} x + \cos ec^{-1} x\right)$ is equal to :

A. 1

B. 0

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

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

Answer: A

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5. $\tan^{-1}(1) - \cot^{-1}(-1)$ is equal to :

A. π

B. 0

C. 2

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

Answer: D

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6. $\tan^{-1}\left(\frac{1}{\sqrt{3}}\right) - \cot^{-1}\left(-\frac{1}{\sqrt{3}}\right)$ is equal to :

A. π

B. 0

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

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

Answer: D

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7. Range of the function $f(x) = \sin^{-1} x$ is equal to

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

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

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

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

Answer: D

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8. Principal value of $\sin^{-1}\left(-\frac{1}{2}\right)$ is :

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

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

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

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

Answer: D

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9. If $\sin^{-1}(x) + \cos^{-1}\left(\frac{1}{4}\right) = \frac{\pi}{2}$, then value of x equals :

A. $\frac{1}{4}$

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

C. $\frac{1}{9}$

D. 0

Answer: A

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

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

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

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

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

Answer: B

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

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

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

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

D. none of these

Answer: C

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12. Prove that $\tan^{-1}\frac{1}{2}+\tan^{-1}\frac{2}{11}=\frac{1}{2}\sin^{-1}\frac{24}{25}$

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13. Prove that $\tan^{-1}\frac{2}{11}+\tan^{-1}\frac{7}{24}=\frac{1}{2}\cos^{-1}\frac{3}{5}$

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14. Prove that $\tan^{-1}\frac{1}{4}+\tan^{-1}\frac{2}{9}=\frac{1}{2}\tan^{-1}\frac{4}{3}$

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15. Prove that $\sin^{-1}\frac{3}{5}+\sin^{-1}\frac{4}{5}=\frac{\pi}{2}$

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16. Prove that $\cos^{-1}\frac{3}{5}+\cos^{-1}\frac{4}{5}=\frac{\pi}{2}$

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

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18. Prove that $\cos^{-1}\frac{12}{13}+\sin^{-1}\frac{3}{5}=\sin^{-1}\frac{56}{65}$

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19. Show that $\sin^{-1}\frac{3}{5}-\sin^{-1}\frac{8}{17}=\cos^{-1}\frac{84}{85}$

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20. Find the value of $\tan\left(\sin^{-1}\frac{3}{5}-\cot^{-1}\frac{3}{2}\right)$

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21. Find the value of $\tan\left(\sin^{-1}\frac{3}{5}+\cot^{-1}\frac{3}{2}\right)$

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22. Prove that $3\cos^{-1}x=\cos^{-1}\left(4x^3-3x\right), x\in\left[\frac{1}{2},1\right]$

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23. Write $\tan^{-1}\left(\frac{\cos x-\sin x}{\cos x+\sin x}\right)$ in simplest form.

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

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25. Find the value of $\cos^{-1}\left(\cos\frac{13\pi}{6}\right)$

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26. Prove that $2\tan^{-1}\frac{1}{3}+\tan^{-1}\frac{1}{7}=\frac{\pi}{4}$

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27. Prove that $2\tan^{-1}\frac{1}{5}+\tan^{-1}\frac{1}{8}=\tan^{-1}\frac{4}{7}$

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28. Show that $\sin^{-1}\frac{3}{5}-\sin^{-1}\frac{8}{17}=\cos^{-1}\frac{84}{85}$

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29. Solve:

$$\tan^{-1}(x+3)+\tan^{-1}(x-3)=\tan^{-1}\left(\frac{4}{39}\right), x>0$$

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30. Solve:

$$\tan^{-1}(x+4)+\tan^{-1}(x-4)=\tan^{-1}\left(\frac{4}{67}\right), x>0$$

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31. Prove that

$$\tan^{-1}\frac{1}{2}+\tan^{-1}\frac{2}{11}=\tan^{-1}\frac{3}{4}$$

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32. Express $\tan^{-1}\left(\frac{\cos x}{1-\sin x}\right), -\frac{\pi}{2}<x<\frac{\pi}{2}$ in the simplest form.

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33. Prove that

$$2\tan^{-1}\frac{1}{5}+\tan^{-1}\frac{1}{4}=\tan^{-1}\frac{32}{43}$$

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34. Prove that $\sin^{-1}\frac{3}{5}+\sin^{-1}\frac{8}{17}=\cos^{-1}\frac{36}{85}$

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35. Prove that $\sin^{-1}\frac{4}{5}+\sin^{-1}\frac{5}{13}=\cos^{-1}\frac{16}{65}$

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36. Prove that $\sin^{-1}\left(2x.\sqrt{1-x^2}\right) = 2\cos^{-1}x, \frac{1}{\sqrt{2}} \leq x < 1$

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37. Write $\tan^{-1}\left(\sqrt{\frac{1-\cos x}{1+\cos x}}\right)$, x < pi in the simplest form.

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38. Prove that $\cot^{-1}\left(\frac{\sqrt{1+x}-\sqrt{1-x}}{\sqrt{1+x}+\sqrt{1-x}}\right) = \frac{\pi}{4} + \frac{1}{2}\cos^{-1}x$

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39. Solve the Equation :

$$\tan^{-1}\left(\frac{x-1}{x+2}\right)+\tan^{-1}\left(\frac{2x-1}{2x+1}\right)=\frac{\tan^{-1}23}{36}$$

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

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41. Write $\tan^{-1}\left(\frac{1}{\sqrt{x^2-1}}\right), |x|>1$ in simplest form.

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42. Simplify $\tan^{-1}\left[\frac{a\cos x - b\sin x}{b\cos x + a\sin x}\right]$ if $\frac{a}{b}\tan x \succ 1$

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43. Write the $\tan^{-1}\left(\frac{3a^2x - x^3}{a^3 - 3ax^2}\right), a>0, -\frac{a}{3} \leq x \leq \frac{a}{3}$. in the simplest form.

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44. Prove that :

$$\cot^{-1}\left[\frac{\sqrt{1+\sin x}+\sqrt{1-\sin x}}{\sqrt{1+\sin x}+\sqrt{1-\sin x}}\right]=\frac{x}{2}, x \in \left(0, \frac{\pi}{4}\right)$$

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45. Prove that

$$\tan^{-1}\frac{63}{16}=\sin^{-1}\frac{5}{13}+\cos^{-1}\frac{3}{5}$$

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46. Solve

$$\tan^{-1}(x+1)+\tan^{-1}(x-1)=\tan^{-1}\frac{8}{31}$$

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47. Prove that $\tan^{-1}\frac{2}{11}+\tan^{-1}\frac{7}{24}=\tan^{-1}\frac{1}{2}.$

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48. Prove that $\tan^{-1}\frac{2}{11}+\tan^{-1}\frac{7}{24}=\tan^{-1}\frac{1}{2}.$

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