MATHS

NCERT - NCERT MATHEMATICS(TELUGU)

INVERSE TRIGONOMETRIC FUNCTIONS

Example

1. Find the principle value of $\sin^{-1}\left(\dfrac{1}{\sqrt{2}}\right)$

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2. Find the principle value of $\cot^{-1}\left(\dfrac{-1}{\sqrt{3}}\right)$

3. Show that

(i) $\sin^{-1}\left(2x\sqrt{1-x^2}\right) = 2\sin^{-1}x, \quad -\dfrac{1}{\sqrt{2}} \le x \le \dfrac{1}{\sqrt{2}}$

(ii) $\sin^{-1}\left(2x\sqrt{1-x^2}\right) = 2\cos^{-1}x, \quad \dfrac{1}{\sqrt{2}} \le x \le 1$

4. Show that $\tan^{-1}\dfrac{1}{2} + \tan^{-1}\dfrac{2}{11} = \tan^{-1}\dfrac{3}{4}$

5. Express $\tan^{-1}\dfrac{\cos x}{1-\sin x}, \quad \dfrac{-3\pi}{2} < x < \dfrac{\pi}{2}$ in the simplest form.

6. Write $\cot^{-1}\left(\dfrac{1}{\sqrt{x^2-1}}\right)$, $x > 1$ in the simplest form.

7. Prove that

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

8. Find the value of $\cos\left(\sec^{-1}x + \cos ec^{-1}x\right), |x| \geq 1$

9. Find the values of $\sin^{-1}\left(\sin\dfrac{3\pi}{5}\right)$

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

11. $\sin^{-1}\left(\dfrac{12}{13}\right) + \cos^{-1}\left(\dfrac{4}{5}\right) + \tan^{-1}\left(\dfrac{63}{16}\right) =$

12. Simplify $\tan^{-1}\left[\dfrac{a\cos x - b\sin x}{b\cos x + a\sin x}\right]$ if $\dfrac{a}{b}\tan x > -1$

13. Sovle $\tan^{-1} 2x + \tan^{-1} 3x = \dfrac{\pi}{4}$

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1. Find the Principle values of the following :

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

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2. Find the Principle values of the following :

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

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3. Find the Principle values of the following :

$$\cos ec^{-1}(2)$$

4. Find the Principle values of the following :

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

5. Find the Principle values of the following :

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

6. Find the Principle values of the following :

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

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7. Find the Principle values of the following :

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

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8. Find the Principle values of the following :

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

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9. Find the Principle values of the following :

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

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10. Find the Principle values of the following :

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

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11. Find the values of the following :

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

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12. Find the values of the following :

$\cos^{-1}\dfrac{1}{2} + 2\sin^{-1}\dfrac{1}{2}$

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13. Find the values of the following :

If $\sin^{-1} x = y$ then

A. $0 \leq y \leq \pi$

B. $-\dfrac{\pi}{2} \leq y \leq \dfrac{\pi}{2}$

C. $0 < y < \pi$

D. $-\dfrac{\pi}{2} < y < \dfrac{\pi}{2}$

Answer: B

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14. Find the values of the following :

$\tan^{-1}\sqrt{3} - \sec^{-1}(-2)$ is equal to

A. π

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

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

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

Answer: B

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Exercise 2 2

1. Prove the following :

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

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2. Prove the following :

$$3\cos^{-1}x = \cos^{-1}(4x^3 - 3x),\ x\varepsilon\left[\frac{1}{2}, 1\right]$$

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3. Prove the following :

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

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4. $2\tan^{-1}\dfrac{1}{3} + \tan^{-1}\dfrac{1}{7} =$

5. Write the following function in the simplest form :

$\tan^{-1}\dfrac{\sqrt{1+x^2}-1}{x}, \; x \neq 0$

6. Write the following function in the simplest form :

$\tan^{-1}\dfrac{1}{\sqrt{x^2-1}}, \; |x| > 1$

7. Write the following function in the simplest form :

$$\tan^{-1}\left(\sqrt{\frac{1-\cos x}{1+\cos}}\right), 0 < x < \pi$$

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8. Write the following function in the simplest form :

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

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9. Write the following function in the simplest form :

$$\tan^{-1}\frac{x}{\sqrt{a^2 - x^2}}, |x| < a$$

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10. Write the following function in the simplest form :

$$\tan^{-1}\left(\frac{3a^2x - x^3}{a^3 - 3ax^2}\right), a > 0, \frac{-1}{\sqrt{3}} < x < \frac{a}{\sqrt{3}}$$

11. Find the values of each of the following :

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

12. Find the values of each of the following :

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

13. Find the values of each of the following :

$$\tan\frac{1}{2}\left[\sin^{-1}\frac{2x}{1+x^2} + \cos^{-1}\frac{1-y^2}{1+y^2}\right], |x| < 1, y > 0 \quad \text{and}$$

$xy < 1$

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14. Find the values of each of the following :

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

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

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

17. Find the values of each of the expression following :

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

18. Find the values of each of the expression following :

$\tan\left(\sin^{-1}\dfrac{3}{5} + \cot^{-1}\dfrac{3}{2}\right)$

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

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

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

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

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

Answer: B

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20. $\sin\left(\dfrac{\pi}{3} - \sin^{-1}\left(-\dfrac{1}{2}\right)\right)$ is equal to

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

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

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

D. 1

Answer: D

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

A. π

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

C. 0

D. $2\sqrt{3}$

Answer: B

Miscellaneous Exercise

1. Find the value of the following

$$\cos^{-1}\left(\cos\frac{13\pi}{6}\right)$$

2. Find the value of the following

$$\tan^{-1}\tan\frac{7\pi}{6}$$

3. Prove That :

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

4. Prove That :

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

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

6. Prove That :

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

7. Prove That :

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

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

9. Prove That :

$$\tan^{-1}\sqrt{x} = \frac{1}{2}\cos^{-1}\frac{1-x}{1+x}, \ x\varepsilon[0, 1]$$

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

11. Prove That :

$\tan^{-1}\left(\dfrac{\sqrt{1+x}-\sqrt{1-x}}{\sqrt{1+x}+\sqrt{1-x}}\right)=\dfrac{\pi}{4}-\dfrac{1}{2}\cos^{-1}x=\dfrac{1}{\sqrt{2}}<x\leq 1$

12. Prove That :

$\dfrac{9\pi}{4}-\dfrac{9}{8}\sin^{-1}\dfrac{1}{3}=\dfrac{9}{4}\sin^{-1}\dfrac{2\sqrt{2}}{3}$

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

14. Solve the following equations :

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

15. Solve the following equations :

$\sin(\tan^{-1}x), \ |x| < 1$ equal to

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

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

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

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

Answer: D

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16. Solve the following equations :

$\sin^{-1}(1-x) - 2\sin^{-1}x = \dfrac{\pi}{2}$ then x is equal to

A. $0, \dfrac{1}{2}$

B. $1, \dfrac{1}{2}$

C. 0

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

Answer: C

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17. Solve the following equations :

$\tan^{-1}\left(\dfrac{x}{y}\right) - \tan^{-1}\dfrac{x-y}{x+y}$ is equal to

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

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

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

D. $\dfrac{3\pi}{4}$

Answer: C

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