



## MATHS

### NCERT - FULL MARKS MATHS(TAMIL)

### INVERSE TRIGONOMETRIC FUNCTIONS

#### Example

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



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



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3. Show that

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

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

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

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

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

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

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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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10. Show that  $\sin^{-1} \frac{12}{13} + \cos^{-1} \frac{4}{5} + \tan^{-1} \frac{63}{16} = \pi$

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



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



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



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14. Find the principal value of

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



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15. Find the principal value of

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



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16. Find the principal value of

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



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17. Find

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



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



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19. Find  $\cos^{-1}\left(\cos\left(-\frac{\pi}{3}\right)\right)$

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

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

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22. Find the principal value of  $\tan^{-1}(\sqrt{3})$

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23. Find  $\tan^{-1}(-\sqrt{3})$



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24. Find  $\tan^{-1}\left(\tan\frac{3\pi}{5}\right)$



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25.  $\tan(\tan^{-1}(2019))$



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



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28. Find the principal value of  $\operatorname{cosec}^{-1}(-1)$



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



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



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



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32. Show that  $\cot^{-1}\left(\frac{1}{\sqrt{x^2-1}}\right) = \sec^{-1} x \mid x \mid > 1$

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

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

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

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36. Find the value of  $\cos \left[ \frac{1}{2} \cos^{-1} \left( \frac{1}{8} \right) \right]$

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

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

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

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



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41. If  $\cos^{-1} x + \cos^{-1} y = z = \pi$  and  $0 \leq x, y, z < 1$  show that  $x^2 + y^2 = 0$



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42. If  $a_1, a_2, a_3 \dots a_n$  is an arithmetic progression with common difference

$d$ , prove that

$$\tan^{-1} \left( \frac{d}{1 + a_1 a_2} \right) + \tan^{-1} \left( \frac{d}{1 + a_2 a_3} \right) + \dots + \tan^{-1} \left( \frac{d}{1 + a_{n-1} a_n} \right) = \tan^{-1} \left( \frac{d}{1 + a_1 a_n} \right)$$



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



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



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45. 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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46. 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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## Exercise 2 1

1. Find the Principle values of the following :

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



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2. Find the Principle values of the following :

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

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3. Find the Principle values of the following :

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

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4. Find the Principle values of the following :

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

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5. Find the Principle values of the following :

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

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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 :

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

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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 :

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



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11. Find the values of the following :

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



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12. Find the values of the following :

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

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13. Find the values of the following :

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

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

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

C.  $0 < y < \pi$

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

**Answer: B**

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14. Find the values of the following :

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

A.  $\pi$



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

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

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

**Answer: B**



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## Exercise 2 2

1. Write the following function in the simplest form :

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



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2. Write the following function in the simplest form :

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



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3. Write the following function in the simplest form :

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

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4. 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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5. Write the following function in the simplest form :

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

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6. Write the following function in the simplest form :

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

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7. Find the values of each of the following :

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

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8. Find the values of each of the following :

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

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9. Find the values of each of the following :

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



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10. Find the values of each of the following :

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



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11. Find the values of each of the following :

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



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

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



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

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

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

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

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15.  $\cos^{-1}\left(\cos\frac{7\pi}{6}\right)$  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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16.  $\sin\left(\frac{\pi}{3} - \sin^{-1}\left(-\frac{1}{2}\right)\right)$  is equal to

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

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

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

D. 1

**Answer: D**



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

A.  $\pi$

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

C. 0

D.  $2\sqrt{3}$

**Answer: B**



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## Miscellaneous Exercise

1. Find the value of the following

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



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2. Find the value of the following

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



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3. Solve the following equations :

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



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4. Solve the following equations :

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



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5. Solve the following equations :

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

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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**6. Solve the following equations :**

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

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

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

C. 0

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

**Answer: C**

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7. Solve the following equations :

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

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

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

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

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

**Answer: C**



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### Exercise 4 1

1. Find all the values of  $x$  such that  $-10\pi \leq x \leq 10\pi$  and  $\sin x = 0$



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2. Find all the values of  $x$  such that  $-8\pi \leq x \leq 8\pi$  and  $\sin x = -1$



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3. Find the period and amplitude of  $y = \sin 7x$



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4. Find the period and amplitude of  $y = -\sin\left(\frac{1}{3}x\right)$



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5. Find the period and amplitude of  $y = 4\sin(-2x)$



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

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

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8. For what value of  $x$  does  $\sin s = \sin^{-1} x$ ?

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9. Find the domain of the following  $f(x) = \sin^{-1}\left(\frac{x^2 + 1}{2x}\right)$

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10. Find the domain of the following  $g(x) = 2 \sin^{-1}(2x - 1) - \frac{\pi}{4}$

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11. 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  $-6\pi \leq x \leq 6\pi$  and  $\cos x = 0$

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2. Find all values of  $x$  such that  $-6\pi \leq x \leq 5\pi$  and  $\cos x = 1$

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

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

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

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

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

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8. Find the value of  $\cos^{-1}\left(\cos\frac{\pi}{7}\cos\frac{\pi}{17} - \sin\frac{\pi}{7}\sin\frac{\pi}{17}\right)$



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9. Find the domain of  $f(x) = \sin^{-1}\left(\frac{|x| - 2}{3}\right) + \cos^{-1}\left(\frac{1 - |x|}{4}\right)$



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10. Find the domain of  $g(x) = \sin^{-1} x + \cos^{-1} x$



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11. For what value of  $x$ , the inequality  $\frac{\pi}{2} < \cos^{-1}(3x - 1) < \pi$  holds ?



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12. Find the value of  $\cos^{-1}\left(\cos\left(\frac{4\pi}{3}\right)\right) + \cos^{-1}\left(\cos\left(\frac{5\pi}{4}\right)\right)$



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## Exercise 4 3

1. Find the domain of the following functions :  $\tan^{-1}(\sqrt{9 - x^2})$

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2. Find the domain of the following functions :  $\frac{1}{2}\tan^{-1}(1 - x^2) - \frac{\pi}{4}$

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

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

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



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6. Find the value of  $\tan(\tan^{-1}(1947))$



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7. Find the value of  $\tan(\tan^{-1}(-0.2021))$



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8. 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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9. Find the value of  $\sin\left(\tan^{-1}\left(\frac{1}{2}\right) - \cos\left(\frac{4}{5}\right)\right)$



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10. Find the value of  $\cos\left(\sin^{-1}\left(\frac{4}{5}\right) - \tan^{-1}\left(\frac{3}{4}\right)\right)$



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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 principal value of  $\cot^{-1}(\sqrt{3})$



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3. Find the principal value of  $\operatorname{cosec}^{-1}(-\sqrt{2})$



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4. Find the value of  $\tan^{-1}(\sqrt{3}) - \sec^{-1}(-2)$



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



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



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

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



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2. Find the value, if it exists. If not, give the reason for non-existence.

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



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3. Find the value, if it exists. If not, give the reason for non-existence.

$$\sin^{-1}[\sin 5]$$



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4. Find the value of the expression in terms of  $x$ , with the help of a reference triangle.  $\sin(\cos^{-1}(1 - x))$

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5. Find the value of the expression in terms of  $x$ , with the help of a reference triangle.  $\cos(\tan^{-1}(3x - 1))$

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6. Find the value of the expression in terms of  $x$ , with the help of a reference triangle.  $\tan\left(\sin^{-1}\left(x + \frac{1}{2}\right)\right)$

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

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



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9. Simplify  $\tan^{-1} \frac{x}{y} - \tan^{-1} \frac{x-y}{x+y}$



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10. Solve :  $\sin^{-1} \frac{5}{x} + \sin^{-1} \frac{12}{x} = \frac{\pi}{x}$



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11. Solve :  $2 \tan^{-1} x = \cos^{-1} \frac{1-a^2}{1+a^2} - \cos^{-1} \frac{1-b^2}{1+b^2}, a > 0, b > 0.$



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12. Solve :  $2 \tan^{-1}(\cos x) = \tan^{-1}(2 \operatorname{cosec} x)$



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13. Solve :  $\cot^{-1} x - \cot^{-1}(x + 1) = \frac{\pi}{12}, x > 0$



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14. Find the number of solution of the equation  
 $\tan^{-1}(x - 1) + \tan^{-1} x + \tan(x + 1) = \tan^{-1}(3x)$



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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.  $x - \pi$

**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.  $\pi$

**Answer: B**



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3.  $\sin^{-1} \frac{3}{4} - \cos^{-1} \frac{12}{13} + \sec^{-1} \frac{5}{3} - \operatorname{cosec}^{-1} \frac{13}{12}$  is equal to

A.  $2\pi$



B.  $\pi$

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  $\cot^{-1} x = \frac{2\pi}{5}$  for some  $x \in \mathbb{R}$ , 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  $\cos(\cos^{-1}x + 2\sin^{-2}x)$  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.  $[-2, -\sqrt{2}]$

**Answer: C**



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**12.** If  $\cot^{-1} 2$  and  $\cot^{-1} 3$  are two angles 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.  $\sin^{-1}(2 \cos^2 x - 1) + \cos^{-1}(1 - 2 \sin^2 x) =$

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

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

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

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

**Answer: A**

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15. If  $\cot^{-1}(\sqrt{\sin \alpha}) + \tan^{-1}(\sqrt{\sin \alpha}) = u$  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. If  $|x| \leq 1$  then  $2\tan^{-1}x - \sin^{-1}\frac{2x}{1+x^2}$  is equal to

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

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

C. 0



D.  $\pi$

**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  $\sin^{-1} x + \cot^{-1} \left( \frac{1}{2} \right) = \frac{\pi}{2}$ , 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  $\sin^{-1} \frac{x}{5} + \operatorname{cosec}^{-1} \frac{5}{4} = \frac{\pi}{2}$ , then the value of x is

A. 4

B. 5

C. 2

D. 3

**Answer: D**



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20.  $\sin(\tan^{-1} x)$ ,  $|x| \leq 1$  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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