NCERT Solutions for 12th Class Maths: Chapter 2-Inverse Trigonometric Functions

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Class 12: Maths Chapter 2 solutions. Complete Class 12 Maths Chapter 2 Notes.

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Exercise 2.1

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Find the principal values of the following:

1. $\sin^{-1}(-1/2)$

Answer

1. Let $\sin^{-1}(-1/2) = y$, then

$\sin y = -1/2 = -\sin(\pi/6) = \sin(-\pi/6)$

Range of the principal value of sn^{-1} is $[-\pi/2, \pi/2]$ and $\sin -\pi/6) = -1/2$

Therefore, the principal value of $\sin^{-1}(-1/2)$ is $-\pi/6$.

2. $\cos^{-1}(\sqrt{3}/2)$

Answer

Let $\cos^{-1}(\sqrt{3}/2) = y$,

$\cos y = \sqrt{3}/2 = \cos(\pi/6)$

We know that the range of the principal value branch of $\cos^{-1}$ is $[0, \pi]$ and $\cos(\pi/6) = \sqrt{3}/2$

Therefore, the principal value of $\cos^{-1}(\sqrt{3}/2)$ is $\pi/6$.

3. $\text{cosec}^{-1}(2)$

Answer

Let $\text{cosec}^{-1}(2) = y$.

Then, $\text{cosec}\ y = 2 = \text{cosec}(\pi/6)$

We know that the range of the principal value branch of cosec^{-1} is $[-\pi/2, \pi/2] - \{0\}$ and $\text{cosec}(\pi/6) = 2$.

Therefore, the principal value of $\text{cosec}^{-1}(2)$ is $\pi/6$.

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

Answer

Let $\tan^{-1}(-\sqrt{3}) = y$,

then $\tan y = -\sqrt{3} = -\tan \pi/3 = \tan(-\pi/3)$

We know that the range of the principal value branch of $\tan^{-1}$ is $(-\pi/2, \pi/2)$ and $\tan(-\pi/3)$

$= -\sqrt{3}$

Therefore, the principal value of $\tan^{-1}(-\sqrt{3})$ is $-\pi/3$

5. $\cos^{-1}(-1/2)$

Answer

Let $\cos^{-1}(-1/2) = y$,

then $\cos y = -1/2 = -\cos \pi/3 = \cos(\pi-\pi/3) = \cos(2\pi/3)$

We know that the range of the principal value branch of $\cos^{-1}$ is $[0, \pi]$ and $\cos(2\pi/3) = -1/2$

Therefore, the principal value of $\cos^{-1}(-1/2)$ is 2π

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

Answer

Let $\tan^{-1}(-1) = y$. Then, $\tan y = -1 = -\tan(\pi/4) = \tan(-\pi/4)$

We know that the range of the principal value branch of $\tan^{-1}$ is $(-\pi/2, \pi/2)$ and $\tan(-\pi/4) = -1$.

Therefore, the principal value of $\tan^{-1}(-1)$ is $-\pi/4$.

7. $\sec^{-1}(2/\sqrt{3})$

Answer

Let $\sec^{-1}(2/\sqrt{3}) = y$, then $\sec y = 2/\sqrt{3} = \sec(\pi/6)$

We know that the range of the principal value branch of sec^{-1} is [0, π] − {π/2} and sec (π/6) = 2/√3.

Therefore, the principal value of sec^{-1}(2/√3) is π/6.

8. cot^{-1}(√3)

Answer

Let cot^{-1}√3 = y, then cot y = √3 = cot (π/6).

We know that the range of the principal value branch of cot^{-1} is (0, π) and cot (π/6) = √3.

Therefore, the principal value of cot^{-1}√3 is π.

9. cos^{-1}(-1/√2)

Answer

Let cos^{-1}(-1/√2) = y,

then cos y = -1/√2 = -cos (π/4) = cos (π - π/4) = cos (3π/4).

We know that the range of the principal value branch of cos^{-1} is [0, π] and cos (3π4) = -1/√2.

Therefore, the principal value of cos^{-1}(-1/√2) is 3π/4.

10. $cosec^{-1}$(-√2)

Answer

Let $cosec^{-1}$(−√2) = y, then cosec y = −√2 = −cosec (π/4) = cosec (−π/4)

We know that the range of the principal value branch of $cosec^{-1}$ is [-π/2, π/2]-{0} and cosec(-π/4) = -√2.

Therefore, the principal value of $cosecc^{-1}$(-√2) is -π/4.

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Find the values of the following:

11. $\tan^{-1}(1) + \cos^{-1}(-1/2) + \sin^{-1}(-1/2)$

Answer

Let $\tan^{-1}(1) = x$,

then $\tan x = 1 = \tan(\pi/4)$

We know that the range of the principal value branch of $\tan^{-1}$ is $(-\pi/2, \pi/2)$.

$\therefore \tan^{-1}(1) = \pi/4$

Let $\cos^{-1}(-1/2) = y$,

then $\cos y = -1/2 = -\cos\pi/3 = \cos(\pi - \pi/3)$

$= \cos(2\pi/3)$

We know that the range of the principal value branch of $\cos^{-1}$ is $[0, \pi]$.

$\therefore \cos^{-1}(-1/2) = 2\pi/3$

Let $\sin^{-1}(-1/2) = z$,

then $\sin z = -1/2 = -\sin\pi/6 = \sin(-\pi/6)$

We know that the range of the principal value branch of $\sin^{-1}$ is $[-/\pi2, \pi/2]$.

$\therefore \sin^{-1}(-1/2) = -\pi/6$

Now,

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

$= \pi/4 + 2\pi/3 - \pi/6$

$= (3\pi + 8\pi - 2\pi)/12$

$= 9\pi/12 = 3\pi/4$

12. $\cos^{-1}(1/2) + 2\sin^{-1}(1/2)$

Answer

Let $\cos^{-1}(1/2) = x$, then

$\cos x = 1/2 = \cos \pi/3$

We know that the range of the principal value branch of cos−1 is [0, π].

∴ $\cos^{-1}(1/2)$

$= \pi/3$

Let $\sin^{-1}(-1/2) = y$, then

$\sin y = 1/2$

$= \sin \pi/6$

We know that the range of the principal value branch of $\sin^{-1}$ is [-π/2, π/2].

∴ $\sin^{-1}(1/2) = \pi/6$

Now,

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

$= \pi/3 + 2\times\pi/6$

$= \pi/3 + \pi/3$

$= 2\pi/3$

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

(A) $0 \le y \le \pi$

(B) $-\pi/2 \le y \le \pi/2$

(C) $0 < y < \pi$

(D) $-\pi/2 < y < \pi/2$

Answer

It is given that $\sin^{-1}x = y$.

We know that the range of the principal value branch of $\sin^{-1}$ is $[-\pi/2, \pi/2]$.

Therefore, $-\pi/2 \le y \le \pi/2$.

Hence, the option (B) is correct.

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

(A) π

(B) $-\pi/3$

(C) $\pi/3$

(D) $2\pi/3$

Answer

Let $\tan^{-1}\sqrt{3} = x$,then

$\tan x = \sqrt{3} = \tan \pi/3$

We know that the range of the principal value branch of $\tan^{-1}$ is $(-\pi/2, \pi/2)$.

$\therefore \tan^{-1}\sqrt{3} = \pi/3$

Let $\sec^{-1}(-2) = y$, then

$\sec y = -2 = -\sec \pi/3$

$= \sec(\pi - \pi/3)$

$= \sec(2\pi/3)$

We know that the range of the principal value branch of $\sec^{-1}$ is $[0, \pi]- \{\pi/2\}$

$\therefore \sec^{-1}(-2) = 2\pi/3$

Now,

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

$= \pi/3 - 2\pi/3$

= -π/3

Hence, the option (B) is correct.

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Exercise 2.1

Prove the following:

1. 3sin^{-1}x = sin^{-1}(3x – 4x3), x ∈ [-/2, 1/2]

Answer

To prove:

3sin^{-1}x = sin^{-1}(3x − 4x3), x ∈ [−1/2, 1/2]

Let sin^{-1}x = θ, then x = sin θ.

We have,

RHS = sin-1(3x - 4x^{3})

= sin^{-1}(3 sin θ - 4sin3θ)

= sin^{-1}(sin 3θ) = 3θ

= 3sin^{-1}x = LHS

2. 3cos^{-1}x = cos^{-1}(4x^{3} – 3x) x ∈ [1, 1/2]

Answer

To prove:

3cos^{-1}x = cos^{-1}(4x^{3} – 3x) x ∈ [1, 1/2].

Let cos^{-1}x = θ, then x = cos θ.

We have,

RHS = $\cos^{-1}(4x^3 - 3x)$

= $\cos^{-1}(4\cos^3\theta - 3\cos\theta)$

= $\cos^{-1}(\cos 3\theta) = 3\theta$

= $3\cos^{-1}x$

= LHS

3. $\tan^{-1}2/11 + \tan^{-1}7/24 = \tan^{-1}1/2$

Answer

To prove: $\tan^{-1}2/11 + \tan^{-1}7/24 = \tan^{-1}1/2$

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

$$= tan^{-1}\left(\frac{\frac{2}{11}+\frac{7}{24}}{1-\frac{2}{11}\times\frac{7}{24}}\right) = tan^{-1}\left(\frac{\frac{48+77}{11\times 24}}{\frac{11\times 24-14}{11\times 24}}\right)$$

= $\tan^{-1}(48 + 77)/(264 - 14)$

= $\tan^{-1}125/250 = \tan^{-1}1/2$ = RHS

4. $2\tan^{-1}1/2 + \tan^{-1}1/7 = \tan^{-1}31/17$

Answer

To prove: $2\tan^{-1}1/2 + \tan^{-1}1/7 = \tan^{-1}31/17$

LHS = 2tan-11/2 + tan-11/7

$$= tan^{-1}\left[\frac{2\times\frac{1}{2}}{1-\left(\frac{1}{2}\right)^2}\right] + tan^{-1}\frac{1}{7} = tan^{-1}\frac{1}{\left(\frac{3}{4}\right)} + tan^{-1}\frac{1}{7}$$

$$= tan^{-1}\frac{4}{3} + tan^{-1}\frac{1}{7} = tan^{-1}\left(\frac{\frac{4}{3}+\frac{1}{7}}{1-\frac{4}{3}\times\frac{1}{7}}\right)$$

$$= tan^{-1}\left(\frac{\frac{28+3}{3\times 7}}{\frac{3\times 7-4}{3\times 7}}\right) = tan^{-1}\frac{28+3}{21-4} = tan^{-1}\frac{31}{17} = \text{RHS}$$

Write the following functions in the simplest form:

Question: 5

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

Answer

Given function $\tan^{-1}\frac{\sqrt{1+x^2}-1}{x}$

Let $x = \tan\theta$

$$\therefore tan^{-1}\frac{\sqrt{1+x^2}-1}{x} = tan^{-1}\frac{\sqrt{1+tan^2\theta}-1}{\tan\theta}$$

$$= tan^{-1}\left(\frac{\sec\theta-1}{\tan\theta}\right) = tan^{-1}\left(\frac{1-\cos\theta}{\sin\theta}\right)$$

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

$$= \frac{\theta}{2} = \frac{1}{2}tan^{-1}x$$

Question: 6

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

Answer

Question: 7

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

Answer

The given function is $tan^{-1}\left(\sqrt{\frac{1-\cos x}{1+\cos x}}\right)$

Now,

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

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

Question: 8

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

Answer

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

Now,

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

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

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

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Question: 9

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

Answer

The given function is $\tan^{-1}\frac{x}{\sqrt{a^2-x^2}}$

Let $x = a\sin\theta$

$$\therefore tan^{-1}\frac{x}{\sqrt{a^2-x^2}}=tan^{-1}\left(\frac{a\sin\theta}{\sqrt{a^2-a^2sin^2\theta}}\right)$$

$$=tan^{-1}\left(\frac{a\sin\theta}{a\sqrt{1-sin^2\theta}}\right)$$

$$=tan^{-1}\left(\frac{a\sin\theta}{a\sin\theta}\right)=tan^{-1}(\tan\theta)$$

$$=\theta=sin^{-1}\frac{x}{a}$$

Question: 10

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

Answer

The given function is $\tan^{-1}\left(\frac{3a^2x - x^3}{a^3 - 3ax^2}\right)$

Let $x = a\tan\theta$

$$\therefore tan^{-1}\left(\frac{3a^2x \;-\; x^3}{a^3 \;-3ax^2}\right)$$

$$= tan^{-1}\left(\frac{3a^2.a\ tan\ \theta \;-\; a^3tan^3\theta}{a^3 \;-3a.a^2tan^2\theta}\right)$$

$$= tan^{-1}\left(\frac{3a^3tan\ \theta \;-\; a^3tan^3\theta}{a^3 \;-3a^3tan^2\theta}\right)$$

$$= tan^{-1}\left(\frac{3tan\ \theta \;-tan^3\theta}{1 \;-3tan^2\theta}\right)$$

$$= tan^{-1}(tan3\theta) = 3\theta = 3tan^{-1}\frac{x}{a}$$

Find the values of each of the following:

Question: 11

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

Answer

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

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

$$= \tan^{-1}\left[2\cos\left(2\sin^{-1}\left(\sin\frac{\pi}{6}\right)\right)\right]$$

$$= \tan^{-1}\left[2\cos\left(2\times\frac{\pi}{6}\right)\right]$$

$$= \tan^{-1}\left[2\cos\left(\frac{\pi}{3}\right)\right] = \tan^{-1}\left[2\times\frac{1}{2}\right]$$

$$= \tan^{-1}[1] = \frac{\pi}{4}$$

Question: 12. cot (tan^{-1}a + cot^{-1}a)

Answer

The given function is cot(tan^{-1}a + cot^{-1}a).

∴ cot(tan^{-1}a + cot^{-1}a)

= cot (π/2) [tan^{-1}x + cot^{-1}x = π/2]

= 0

Question: 13

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

Answer

The given function is $\tan\frac{1}{2}\left[\sin^{-1}\frac{2x}{1+x^2}+\cos^{-1}\frac{1-y^2}{1+y^2}\right]$

$\therefore \tan\frac{1}{2}\left[\sin^{-1}\frac{2x}{1+x^2}+\cos^{-1}\frac{1-y^2}{1+y^2}\right]$

$= \tan\frac{1}{2}[2\tan^{-1}x + 2\tan^{-1}y]$

$= tan\frac{1}{2}[2(tan^{-1}x + tan^{-1}y)]$

$= tan[tan^{-1}x + tan^{-1}y]$

$= tan\left[tan^{-1}\frac{x+y}{1-xy}\right] = \frac{x+y}{1-xy}$

Formula used:

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

Question: 14

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

Answer

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

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

$\Rightarrow \left(\sin^{-1}\frac{1}{5}+\cos^{-1}x\right)=\frac{\pi}{2}$ $\left[\sin^{-1}x+\cos^{-1}x=\frac{\pi}{2}\right]$

$\Rightarrow \sin^{-1}\frac{1}{5}=\sin^{-1}x$

$\Rightarrow x=\frac{1}{5}$

Question: 15

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

Answer

Given that $tan^{-1}\frac{x-1}{x-2}+tan^{-1}\frac{x+1}{x+2}=\frac{\pi}{4}$

$$\Rightarrow tan^{-1}\left(\frac{\frac{x-1}{x-2}+\frac{x+1}{x+2}}{1-\frac{x-1}{x-2}\times\frac{x+1}{x+2}}\right)=\frac{\pi}{4}$$

$[\tan^{-1}x+tan^{-1}y=tan^{-1}(\frac{x+y}{1-xy})]$

$$\Rightarrow \frac{\frac{x-1}{x-2}+\frac{x+1}{x+2}}{1-\frac{x-1}{x-2}\times\frac{x+1}{x+2}}=tan\frac{\pi}{4}$$

$$\Rightarrow \frac{\left[\frac{(x-1)(x+2)+(x-2)(x+1)}{(x-2)(x+2)}\right]}{\left[\frac{(x-2)(x+2)-(x-1)(x+1)}{(x-2)(x+2)}\right]}=1$$

$$\Rightarrow \frac{x^2+2x-x-2+x^2+x-2x-2}{x^2-4-(x^2-1)}=1$$

$$\Rightarrow \frac{2x^2-4}{-3}=1$$

$$\Rightarrow 2x^2-4=-3 \Rightarrow x^2=\frac{1}{2} \Rightarrow x=\pm\frac{1}{\sqrt{2}}.$$

Question: 16

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

Answer

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

We know that $\sin^{-1}(\sin x)=x$ if $x\in\left[-\frac{\pi}{2},\frac{\pi}{2}\right]$,

which is the principal value branch of $\sin^{-1}x$.

$= \sin^{-1}\left(\sin\frac{\pi}{3}\right)=\frac{\pi}{3}\in\left[-\frac{\pi}{2},\frac{\pi}{2}\right]$

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

Question: 17

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

Answer

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

We know that $\tan^{-1}(\tan x)$

$= x$ if $x \in \left(-\frac{\pi}{2},\frac{\pi}{2}\right)$, which is the principal value branch of $\tan^{-1}x$.

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

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

$= tan^{-1}\left(\tan\left\{-\frac{\pi}{4}\right\}\right) = -\frac{\pi}{4} \in \left(-\frac{\pi}{2},\frac{\pi}{2}\right)$

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

Question: 18

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

Answer

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

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

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

$\left[\sin^{-1}\frac{a}{b} = tan^{-1}\frac{a}{\sqrt{b^2-a^2}} \; and \; cot^{-1}\frac{a}{b} = tan^{-1}\frac{b}{a}\right]$

$= tan\left(tan^{-1}\frac{3}{4}+tan^{-1}\frac{2}{3}\right)$

$= tan\left[tan^{-1}\left(\frac{\frac{3}{4}+\frac{2}{3}}{1-\frac{3}{4}\times\frac{2}{3}}\right)\right]$

$= tan\left[tan^{-1}\left(\frac{\frac{9+8}{4\times3}}{\frac{4\times3-3\times2}{4\times3}}\right)\right]$

$= tan\left(tan^{-1}\frac{17}{6}\right) = \frac{17}{6}$

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

$= tan^{-1}\left(\tan\left\{-\frac{\pi}{4}\right\}\right) = -\frac{\pi}{4} \in \left(-\frac{\pi}{2},\frac{\pi}{2}\right)$

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

Question: 19

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

(A) $\frac{7\pi}{6}$ (B) $\frac{5\pi}{6}$ (C) $\frac{\pi}{3}$ (D) $\frac{\pi}{6}$

Answer

The correct option is B.

Question: 20

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

(A) $\frac{1}{2}$ (B) $\frac{1}{3}$ (C) $\frac{1}{4}$ (D) 1

Answer

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

range of the principal value branch of $\sin^{-1}$ is $\left[-\frac{\pi}{2},\frac{\pi}{2}\right]$

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

$= \sin\left[\frac{\pi}{3}-\sin^{-1}\left(-\sin\frac{\pi}{6}\right)\right]$

$= \sin\left[\frac{\pi}{3}-\sin^{-1}\left\{\sin\left(-\frac{\pi}{6}\right)\right\}\right]$

$= \sin\left(\frac{\pi}{3}+\frac{\pi}{6}\right) = \sin\left(\frac{3\pi}{6}\right) = \sin\frac{\pi}{2} = 1$

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

The correct option is D.

Question: 21

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

(A) π (B) $-\frac{\pi}{2}$ (C) 0 (D) $2\sqrt{3}$

Answer

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

range of the principal value branch of $\tan^{-1}$ is $\left(-\frac{\pi}{2},\frac{\pi}{2}\right)$ and

$\cot^{-1}$ is $(0, \pi)$.

$$= tan^{-1}\left(tan\frac{\pi}{3}\right) - cot^{-1}\left(-cot\frac{\pi}{6}\right)$$

$$= \frac{\pi}{3} - cot^{-1}\left[cot\left(\pi - \frac{\pi}{6}\right)\right]$$

$$= \frac{\pi}{3} - cot^{-1}\left(cot\frac{5\pi}{6}\right)$$

$$= \frac{\pi}{3} - \frac{5\pi}{6} = \frac{2\pi - 5\pi}{6}$$

$$= -\frac{3\pi}{6} = -\frac{\pi}{2}$$

Hence, $tan^{-1}\sqrt{3} - cot^{-1}(-\sqrt{3}) = -\frac{\pi}{2}$

The correct option is B.

Class 12: Maths Chapter 2 solutions. Complete Class 12 Maths Chapter 2 Notes.

Chapterwise NCERT Solutions for Class 12 Maths :

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