

TOPIC: INVERSE TRIGONOMETRY

Page | 1

Q. 1 Find the value of $\tan^{-1}\left(\frac{x}{y}\right) - \tan^{-1}\left(\frac{x-y}{x+y}\right)$

Q. 2 Prove that $2\tan^{-1}\left(\frac{1}{2}\right) + \tan^{-1}\left(\frac{1}{7}\right) = \tan^{-1}\left(\frac{31}{17}\right)$

Q. 3 Prove that $\frac{9\pi}{8} - \frac{9}{4}\sin^{-1}\left(\frac{1}{3}\right) = \frac{9}{4}\sin^{-1}\left(\frac{2\sqrt{2}}{3}\right)$

Q. 4 Prove that $\tan^{-1}\left(\frac{1}{4}\right) + \tan^{-1}\left(\frac{2}{9}\right) = \frac{1}{2}\tan^{-1}\left(\frac{4}{3}\right)$

Q. 5 Solve for x , $\cos(2\sin^{-1}x) = \frac{1}{9}$, $x > 0$

Q. 6 Prove that $2\tan^{-1}\frac{3}{4} - \tan^{-1}\frac{17}{31} = \frac{\pi}{4}$

Q. 7 Write the principal value of $\cos^{-1}[\cos(680)^\circ]$

Q. 8 Write the principal value of $\tan^{-1}\left[\sin\left(\frac{-\pi}{2}\right)\right]$

Q. 9 Find the value of the following:-

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

Q. 10 Write the value of $\left[\cos^{-1}\frac{\sqrt{3}}{2} + \cos^{-1}\left(-\frac{1}{2}\right)\right]$

Q. 11 Write the value of $\tan^{-1}\left(\frac{a}{b}\right) + \tan^{-1}\left(\frac{a-b}{a+b}\right)$

Q. 12 Write the principal value of

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

Q. 13 Write the principal value of

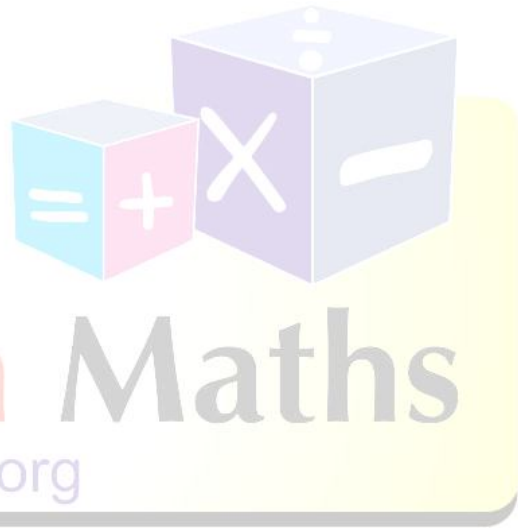
$$\tan^{-1}(\sqrt{3}) - \cot^{-1}(-\sqrt{3}).$$

Q. 14 Write the value of $\cos^{-1}\left(\frac{1}{2}\right) - 2\sin^{-1}\left(-\frac{1}{2}\right)$

Q. 15 Find the principal value of

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

Q. 16 Using the principal values, write the value of



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

Q. 17 Write the value of $\sin\left[\frac{\pi}{3} - \sin^{-1}\left(-\frac{1}{2}\right)\right]$

Page | 2

Q. 18 Write the value of $\tan^{-1}\left(\tan\frac{3\pi}{4}\right)$

Q. 19 Write the value of $\cos^{-1}\left(\cos\frac{7\pi}{6}\right)$

Q. 20 What is the principal value of

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

Q. 21 What is the principal value of $\tan^{-1}(-1)$

Q. 22 Write the value of $\tan\left(2\tan^{-1}\left(\frac{1}{5}\right)\right)$

Q. 23 Write the value of $\tan\left(2\sin\left(2\cos^{-1}\frac{\sqrt{3}}{2}\right)\right)$

Q. 24 If $\sin\left(\sin^{-1}\frac{1}{5} + \cos^{-1}x\right) = 1$, then find the value of x

Q. 25 If $\tan^{-1}\frac{1}{5} + \tan^{-1}x = \frac{\pi}{4}$; $xy < 1$, then write the value of $x + y + xy$.

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

Q. 26 Using the principal values, write the value of $\sin^{-1}\left(-\frac{\sqrt{3}}{2}\right)$

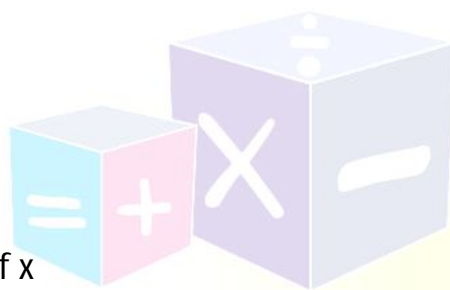
Q. 27 Write the principal value of $\sin^{-1}\left(-\frac{1}{2}\right)$

Q. 28 Write the principal value of $\sin^{-1}\left(\frac{\sqrt{3}}{2}\right)$

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

Q. 30 What is the domain of the function $\sin^{-1}x$?

Q. 31 Using the principal value, find the value of $\cos^{-1}\left(\cos\frac{13\pi}{6}\right)$.



Let's Play

with Maths

www.top4uwithmaths.org

Q. 32 If $\tan^{-1}(\sqrt{3}) + \cot^{-1} x = \frac{\pi}{2}$, then find the value of x .

Q. 33 Write the principal value of $\sin^{-1}\left(\sin \frac{3\pi}{5}\right)$

Page | 3
Q. 34 Using the principal value of $\tan^{-1}(1) + \sin^{-1}\left(-\frac{1}{2}\right)$

Q. 35 Find the principal value of $\cos^{-1}\left(\frac{\sqrt{3}}{2}\right)$

Q. 36 Find the following:-

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

if $|x| < 1, y > 0$ and $xy < 1$

Q. 37 Prove that

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

Q. 38 Prove that

$$\tan^{-1}\left(\frac{\cos x}{1 + \sin x}\right) = \frac{\pi}{4} - \frac{x}{2}, \quad x \in \left(-\frac{\pi}{2}, \frac{\pi}{2}\right)$$

Q. 39 Prove that

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

Q. 40 Prove that

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

Q. 41 Prove that

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

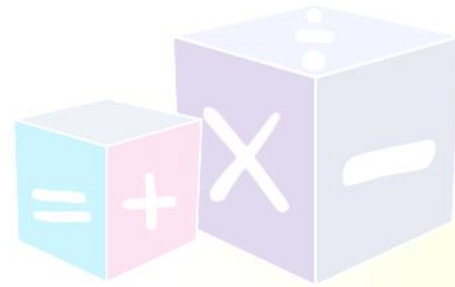
Q. 42 Solve for x ,

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

Q. 43 Solve for x

$$\tan^{-1}(x+2) + \tan^{-1}(x-2) = \tan^{-1}\left(\frac{8}{79}\right), \quad x > 0$$

Q. 44 Prove that



Let's Play with Maths

www.letsplaywithmaths.org

$$\sin^{-1} \frac{4}{5} + \sin^{-1} \frac{5}{13} + \sin^{-1} \frac{16}{65} = \frac{\pi}{2}$$

Q. 45 Prove that

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

Q. 46 Prove that

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

Q. 47 Prove that

$$\sin^{-1} \left(\frac{8}{17} \right) + \sin^{-1} \left(\frac{3}{5} \right) = \cos^{-1} \left(\frac{36}{85} \right)$$

Q. 48 Show that

$$\tan \left(\frac{1}{2} \sin^{-1} \frac{3}{4} \right) = \frac{4 - \sqrt{7}}{3} a$$

Q. 49 Prove that

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

Q. 50 Solve for X,

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

Q. 51 Solve for x, $\tan^{-1}(x) + 2 \tan^{-1}(\cos x) = \tan^{-1}(2 \operatorname{cosec} x)$.

Q. 52 Solve for x, $\tan^{-1}(x) + 2 \cot^{-1}(x) = \frac{2\pi}{3}$.

Q. 53 Prove that,

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

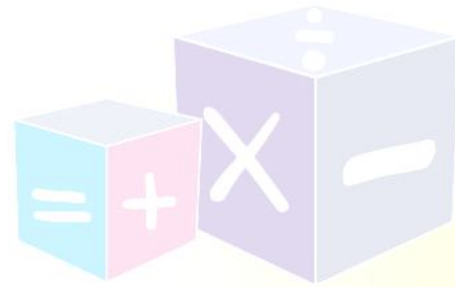
Q. 54 Prove that,

$$2 \tan^{-1} \left(\frac{1}{5} \right) + \operatorname{cosec}^{-1} \left(\frac{5\sqrt{2}}{7} \right) + 2 \tan^{-1} \left(\frac{1}{8} \right) = \frac{\pi}{4}$$

Q. 55 Prove that

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

Q. 56 If $\tan^{-1} \left(\frac{x-2}{x-4} \right) + \tan^{-1} \left(\frac{x+2}{x+4} \right) = \frac{\pi}{4}$, then find the value of x.



Let's Play with Maths
www.letsplaywithmaths.org

Q. 57 Solve for x ,

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

Page | 5 Q. 58 Prove that

$$\tan^{-1}\sqrt{x} = \frac{1}{2}\cos^{-1}\left(\frac{1-x}{1+x}\right), \quad x \in (0, 1)$$

Q. 59 Prove that

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

Q. 60 Prove that

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

Q. 61 Prove that

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

Q. 62 Solve for x ,

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

Q. 63 Solve for x

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

Q. 64 Solve for x

$$\tan^{-1}\left(\frac{1+x}{1-x}\right) = \frac{\pi}{4} + \tan^{-1}x, \quad 0 < x < 1$$

Q. 65 Solve for x ,

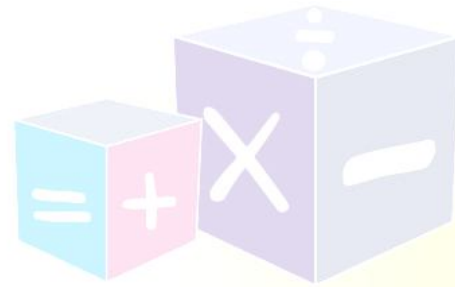
Q. 66 $2 \tan^{-1}(\sin x) = \tan^{-1}(2 \sec x)$, $x \neq \frac{\pi}{2}$ Prove that,

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

Q. 67 Prove that

$$\cot^{-1}7 + \cot^{-1}8 + \cot^{-1}18 = \cot^{-1}3$$

Q. 68 Prove the following



Let's Play with Maths
www.letsplaywithmaths.org

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

Q. 69 Solve the following equation:

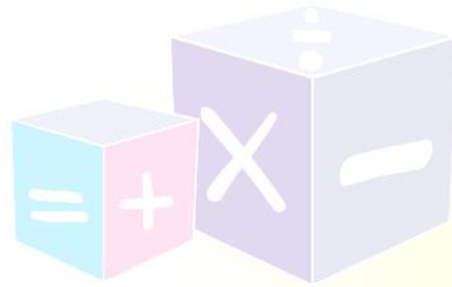
Page | 6

$$\cos(\tan^{-1}(x)) = \sin\left(\cot^{-1}\left(\frac{3}{4}\right)\right)$$

Q. 70 Solve the following equation for x

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

Let's Play



with Maths

www.letsplaywithmaths.org