



Worksheet Name: Inverse Trigonometry Functions

Standard: 12th Science

Subject: Mathematics

Q1. Prove that  $\tan^{-1} \left( \frac{\sqrt{1+x^2} + \sqrt{1-x^2}}{\sqrt{1+x^2} - \sqrt{1-x^2}} \right) = \frac{\pi}{4} + \frac{1}{2} \cos^{-1} x^2$ .

Q2. Prove the following results:

$$2 \sin^{-1} \frac{3}{5} - \tan^{-1} \frac{17}{31} = \frac{\pi}{4}$$

Q3. Find the simplified form of  $\cos^{-1} \left( \frac{3}{5} \cos x + \frac{4}{5} \sin x \right)$ , where  $x \in \left[ \frac{-3\pi}{4}, \frac{\pi}{4} \right]$ .

Q4. Solve the following equation for x:

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

Q5. Prove that:

$$\cot^{-1} \frac{\sqrt{1+\sin x} + \sqrt{1-\sin x}}{\sqrt{1+\sin x} - \sqrt{1-\sin x}} = \frac{x}{2}, 0 < x < \frac{\pi}{2}$$

Q6. Write the following in the simplest form:

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

Q7. Solve:  $\tan^{-1} 4x + \tan^{-1} 6x = \frac{\pi}{4}$ .

Q8. Prove that  $\tan \left[ 2 \tan^{-1} \left( \frac{1}{2} \right) - \cot^{-1} 3 \right] = \frac{9}{13}$ .

Q9. Differentiate  $\tan^{-1} \frac{3x-x^3}{1-3x^2}$ ,  $|x| < \frac{1}{\sqrt{3}}$  w.r.t.  $\tan^{-1} \frac{x}{\sqrt{1-x^2}}$ .

Q10. Write the following in the simplest form:

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

Q11. Find the value of  $\cot \frac{1}{2} \left[ \cos^{-1} \frac{2x}{1+x^2} + \sin^{-1} \frac{1-y^2}{1+y^2} \right]$ ,  $|x| < 1$ ,  $y > 0$  and  $xy < 1$ .

Q12. Find the value of the following:

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

Q13. Prove that :

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

Q14. Prove that  $\cot^{-1} \left( \frac{\sqrt{1+\sin x} + \sqrt{1-\sin x}}{\sqrt{1+\sin x} - \sqrt{1-\sin x}} \right) = \frac{x}{2}; x \in \left( 0, \frac{\pi}{4} \right)$ .

Q15. Solve the following equation for x:

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

Q16. Evaluate the following:

$$\sin \left( \sec^{-1} \frac{17}{8} \right)$$

Q17. Find the value:

$$\tan^{-1} \left( \tan \frac{7\pi}{6} \right)$$

Q18. Prove the following:

$$\cos \left( \sin^{-1} \frac{3}{5} + \cot^{-1} \frac{3}{2} \right) = \frac{6}{5\sqrt{13}}$$

Q19. Find the value:

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

Q20. Write the following in the simplest form:

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

**Q21.** Write the value of  $\cos^{-1} \left( \tan \frac{3\pi}{4} \right)$ .

**Q22.** Find the principal values of the following:

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

**Q23.** Find the principal value of the following:

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

**Q24.** Prove the following results:

$$\sin^{-1} \frac{4}{5} + 2 \tan^{-1} \frac{1}{3} = \frac{\pi}{2}$$

**Q25.** Solve:  $\cos \left( \sin^{-1} x \right) = \frac{1}{6}$