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CBSE 12th Mathematics
Chapter 2 (Inverse Trigonometric Functions)
Important Questions Unsolved

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CBSE 12th Mathematics
Chapter 2 (Inverse Trigonometric Functions)
Important Questions Unsolved

SECTION - A

Question number 1 to 19 carry 1 mark each.

Q. 1: What is the principal value of:

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

Q.2: Write the principle value of:

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

Q.3: Using principal value, evaluate the following:

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

Q.4: Write the principal value of:

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

Q.5: Write the principal value of $sec^{-1}\ (-2)$.

Q.6: What is the principle value of:

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

Q.7: Find the principle value of :

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

Q.8: Write the principal value of

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

Q.9: Write the value of

$$\tan^{-1}\left[\left(2sin^{-1}\frac{\sqrt{3}}{2}\right)\right]$$

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Q.10: If

$$tan^{-1}x + tan^{-1}y = \frac{\pi}{4}, xy < 1,$$

Then write the value of $x + y + xy$.

Q. 11: Evaluate:

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

Q.12: Using principal value, evaluate the following:

$$\sin^{-1}\left(\sin\frac{3\pi}{5}\right)$$

Q.13: What is the principal value of:

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

Q.14: Write the value of

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

Q.15: Write the principle value of:

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

Q.16: Write the principal value of

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

Q. 17: Write the value of $tan\left(2tan^{-1}\frac{1}{5}\right)$

Q. 18: If $\sin\left(sin^{-1}\frac{1}{5} + cos^{-1}x\right) = 1$

then find the value of x.

Q.19: Solve for x:

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

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SECTION – B

Question number 20 to 53 carry 4 mark each.

Q.20: Prove the following:

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

Q.21: Prove that:

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

Q.22: Solve for x:

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

Q.23: 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.24: If

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

Q.25: Solve for x:

$$tan^{-1}(x+1)+tan^{-1}(x-1)=tan^{-1}\frac{8}{31}$$

Q.26: Prove the following:

$$cot^{-1}\left(\frac{xy+1}{xy-1}\right)+cot^{-1}\left(\frac{yz+1}{y-z}\right)+cot^{-1}\left(\frac{zx+1}{z-x}\right)=0$$

$(0<xy,yz,zx<1)$

Q.27: Show that:

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

Q.28: Solve the following equation:

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

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Q.29: Prove the following:

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

Q.30: If

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

Then find the value of x.

Q.31: Prove the following:

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

Q.32: 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.33: Prove the following:

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

Q.34: Solve for x:

$$2\,tan^{-1}(cos\,x)=tan^{-1}(2\,cosec\,x).$$

Q.35: Prove the following:

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

Q.36: Prove the following:

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

Q.37: 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.38: Solve the equation for x

$$\sin^{-1}x+\sin^{-1}(1-x)=\cos^{-1}x$$

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Q.39: If

$$\cos^{-1}\frac{x}{a}+\cos^{-1}\frac{y}{b}=\alpha,$$

Prove that

$$\frac{x^2}{a^2}-2\frac{xy}{ab}\cos\alpha+\frac{y^2}{b^2}=\sin^2\alpha.$$

Q.40: Prove that

$$\tan\left\{\frac{\pi}{4}+\frac{1}{2}\cos^{-1}\frac{a}{b}\right\}+\tan\left\{\frac{\pi}{4}-\frac{1}{2}\cos^{-1}\frac{a}{b}\right\}=\frac{2b}{a}$$

Q.41: Prove the following:

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

Q.42: Prove the following:

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

Q.43: Prove the following:

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

Q.44: Find the value of:

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

Q.45: Prove that:

$$tan^{-1}\left(\frac{cosx}{1+sinx}\right)=\frac{\pi}{4}-\frac{x}{2}, x\epsilon\left(-\frac{\pi}{2},\frac{\pi}{2}\right).$$

Q.46: Prove that

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

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Q.47: Find the value of the following:

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

$$|x|<1, y>0 \; and \; xy<1.$$

Q.48: 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. 49: Prove that

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

Q.50: Prove that

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

Q.51: If $\sin[\cot^{-1}(x+1)]=\cos(\tan^{-1}x)$, thenfind x.

Q.52: If

$$(tan^{-1}x)^2+(cot^{-1}x)^2=\frac{5\pi^2}{8}, \text{then find } x.$$

Q.53: Prove that:

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

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