EXPRESSWALA ACADEMY

Maths 1A: Inverse Trigonometric Functions

MCQ Test, Set 02

Time: 30 minutes | Maximum marks: 25

Name: _____ Class: _____ Date: _____

1. There are 25 questions. Each has exactly one correct answer: choose A, B, C or D.
2. Each correct answer carries 1 mark. There is no negative marking.
3. The key sheet and worked solutions are at the end of this test.

1. The domain of $\sin^{-1}(2x-3)$ is

A. $[1, 2]$ **B.** $[-\frac{1}{2}, \frac{1}{2}]$

C. $[2, 4]$ **D.** $[-2, -1]$

2. The principal value of $\sin^{-1}(-1)$ is

A. $\frac{3\pi}{2}$ **B.** $\frac{\pi}{2}$ **C.** $-\frac{\pi}{2}$ **D.** π

3. The principal value of $\operatorname{cosec}^{-1}\left(-\frac{2}{\sqrt{3}}\right)$ is

A. $\frac{5\pi}{6}$ **B.** $\frac{4\pi}{3}$ **C.** $-\frac{\pi}{3}$ **D.** $\frac{\pi}{3}$

4. $\cos^{-1}(\cos\theta) = \theta$ holds for

A. $\theta \in [0, \pi]$ **B.** $\theta \in [-1, 1]$

C. all real θ **D.** $\theta \in \left[-\frac{\pi}{2}, \frac{\pi}{2}\right]$

5. $\sin\left(\sin^{-1}\frac{5}{6}\right) =$

A. $-\frac{5}{6}$ **B.** $\frac{1}{6}$ **C.** $\frac{5}{6}$ **D.** $\frac{6}{5}$

6. If $\sin^{-1}\frac{3}{8} = \alpha$, then $\sin^{-1}\left(-\frac{3}{8}\right) =$

A. $-\alpha$ **B.** $\frac{\pi}{2} - \alpha$ **C.** α **D.** $\pi + \alpha$

7. If $\sec^{-1} 7 = \alpha$, then $\sec^{-1}(-7) =$

A. α **B.** $\frac{\pi}{2} - \alpha$ **C.** $\pi + \alpha$ **D.** $\pi - \alpha$

8. $\cot^{-1}\left(-\frac{9}{2}\right)$ in terms of an inverse tangent is

A. $\frac{\pi}{2} - \sin^{-1}\frac{9}{2}$ **B.** $\pi + \tan^{-1}\frac{2}{9}$

C. $\tan^{-1}\frac{2}{9}$ **D.** $\pi - \tan^{-1}\frac{2}{9}$

9. If $\cot^{-1} x = \frac{\pi}{9}$, then $\tan^{-1} x =$

A. $-\frac{\pi}{9}$ **B.** $\frac{7\pi}{18}$ **C.** $\frac{8\pi}{9}$ **D.** $\frac{\pi}{9}$

10. $\sin^{-1}\frac{2}{9} + \cos^{-1}\frac{2}{9} =$

A. $\frac{\pi}{4}$ **B.** $\frac{\pi}{2}$ **C.** π **D.** 0

11. $\cos^{-1}\frac{4}{5}+\cos^{-1}\frac{5}{13}=$

A. $-\cos^{-1}\left(-\frac{16}{65}\right)$ **B.** $\cos^{-1}\frac{56}{65}$

C. $\sin^{-1}\left(-\frac{16}{65}\right)$ **D.** $\cos^{-1}\left(-\frac{16}{65}\right)$

12. $\tan^{-1}\frac{1}{7}+\tan^{-1}\frac{1}{3}=$

A. $\pi+\tan^{-1}\frac{1}{2}$ **B.** $\tan^{-1}\frac{1}{2}$

C. $\tan^{-1}\frac{10}{21}$ **D.** $-\pi+\tan^{-1}\frac{1}{2}$

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

A. $\frac{\pi}{3}$ **B.** $\frac{3\pi}{4}$ **C.** $\frac{\pi}{4}$ **D.** $-\frac{\pi}{4}$

14. $\tan^{-1}\frac{1}{2}+\tan^{-1}\frac{1}{3}+\tan^{-1}\frac{1}{7}=$

A. $\tan^{-1}\frac{41}{30}$ **B.** $\tan^{-1}\frac{20}{27}$

C. $\tan^{-1}\frac{41}{42}$ **D.** $\tan^{-1}\frac{4}{3}$

15. $\sin^{-1}\left(-\frac{5}{13}\right)$ written as an inverse cosine is

A. $\cos^{-1}\left(-\frac{12}{13}\right)$ **B.** $-\cos^{-1}\frac{12}{13}$

C. $-\cos^{-1}\frac{5}{13}$ **D.** $\cos^{-1}\frac{12}{13}$

16. $\cos^{-1}\frac{20}{29}$ written as an inverse tangent is

A. $\tan^{-1}\frac{21}{20}$ **B.** $\tan^{-1}\frac{20}{21}$

C. $\tan^{-1}\frac{21}{29}$ **D.** $\pi-\tan^{-1}\frac{21}{20}$

17. $2\tan^{-1}\frac{2}{3}$ written as a single inverse cosine is

A. $\cos^{-1}\left(-\frac{5}{13}\right)$ **B.** $-\cos^{-1}\frac{5}{13}$

C. $\cos^{-1}\frac{5}{13}$ **D.** $\cos^{-1}\frac{12}{13}$

18. $2\tan^{-1}6$ written as a single inverse tangent is

A. $\pi+\tan^{-1}\frac{12}{35}$ **B.** $\tan^{-1}\frac{12}{35}$

C. $\tan^{-1}12$ **D.** $\pi-\tan^{-1}\frac{12}{35}$

19. The graph of $y=\cot^{-1}x$ passes through

A. $\left(0,\frac{\pi}{2}\right)$ **B.** $(1,0)$

C. $(0,0)$ **D.** $(0,\pi)$

20. $\tan^{-1}(\tan 4)=$

A. $4-\pi$ **B.** 4 **C.** $-4+2\pi$ **D.** $-4+\pi$

21. $\cos^{-1}(\cos 6)=$

A. $6-\pi$ **B.** 6 **C.** $-6+2\pi$ **D.** $6-2\pi$

22. For $x<0$, $\cos^{-1}\frac{1-x^2}{1+x^2}=$

A. $2\tan^{-1}x$ **B.** $-(-2\tan^{-1}x)$

C. $\pi+(-2\tan^{-1}x)$ **D.** $-2\tan^{-1}x$

23. If $\cos^{-1} x + \cos^{-1} y = \frac{\pi}{6}$, then $\sin^{-1} x + \sin^{-1} y =$

A. $\frac{\pi}{6}$ **B.** $\frac{5\pi}{6}$ **C.** $\frac{11\pi}{6}$ **D.** $\frac{\pi}{3}$

24. $\tan^{-1} \frac{2}{9} + \tan^{-1} \frac{7}{11} =$

A. $\frac{\pi}{3}$ **B.** $\frac{\pi}{2}$ **C.** $\frac{\pi}{6}$ **D.** $\frac{\pi}{4}$

25. To remove the root in $\sqrt{9 + x^2}$, use

A. the secant substitution $x = 3\sec\theta$ **B.** the sine substitution $x = 3\sin\theta$

C. the cosine substitution $x = 3\cos\theta$ **D.** the tangent substitution $x = 3\tan\theta$

Key sheet

1. A	**2.** C	**3.** C	**4.** A	**5.** C
6. A	**7.** D	**8.** D	**9.** B	**10.** B
11. D	**12.** B	**13.** C	**14.** D	**15.** B
16. A	**17.** C	**18.** D	**19.** A	**20.** A
21. C	**22.** D	**23.** B	**24.** D	**25.** D

Solutions

1. The domain of $\sin^{-1}(2x-3)$ is

$-1 \le 2x-3 \le 1 \Rightarrow 1 \le x \le 2$

Ans: (A) $[1, 2]$

---

2. The principal value of $\sin^{-1}(-1)$ is

The angle in $\left[-\frac{\pi}{2}, \frac{\pi}{2}\right]$ with $\sin\theta = -1$ is $-\frac{\pi}{2}$.

Ans: (C) $-\frac{\pi}{2}$

---

3. The principal value of $\operatorname{cosec}^{-1}\left(-\frac{2}{\sqrt{3}}\right)$ is

The angle in $\left[-\frac{\pi}{2}, 0\right) \cup \left(0, \frac{\pi}{2}\right]$ with $\operatorname{cosec}\theta = -\frac{2}{\sqrt{3}}$ is $-\frac{\pi}{3}$.

Ans: (C) $-\frac{\pi}{3}$

---

4. $\cos^{-1}(\cos\theta) = \theta$ holds for

It returns θ only when θ is already in the principal range $[0, \pi]$.

Ans: (A) $\theta \in [0, \pi]$

---

5. $\sin\left(\sin^{-1}\frac{5}{6}\right) =$

$\sin(\sin^{-1}x) = x$ on the domain of $\sin^{-1}$.

Ans: (C) $\frac{5}{6}$

---

6. If $\sin^{-1}\frac{3}{8} = \alpha$, then $\sin^{-1}\left(-\frac{3}{8}\right) =$

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

$\sin^{-1}\left(-\frac{3}{8}\right) = -\alpha$

Ans: (A) $-\alpha$

---

7. If $\sec^{-1}7 = \alpha$, then $\sec^{-1}(-7) =$

$\sec^{-1}(-x) = \pi - \sec^{-1}x$

$\sec^{-1}(-7) = \pi - \alpha$

Ans: (D) $\pi - \alpha$

---

8. $\cot^{-1}\left(-\frac{9}{2}\right)$ in terms of an inverse tangent is

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

$\cot^{-1}\left(-\frac{9}{2}\right) = \pi + \tan^{-1}\left(-\frac{2}{9}\right) = \pi - \tan^{-1}\frac{2}{9}$

Ans: (D) $\pi - \tan^{-1}\frac{2}{9}$

---

9. If $\cot^{-1}x = \frac{\pi}{9}$, then $\tan^{-1}x =$

$\tan^{-1}x = \frac{\pi}{2} - \frac{\pi}{9} = \frac{7\pi}{18}$

Ans: (B) $\frac{7\pi}{18}$

---

10. $\sin^{-1}\frac{2}{9}+\cos^{-1}\frac{2}{9}=$

$\sin^{-1}x+\cos^{-1}x=\frac{\pi}{2}$ for every x in the common domain.

Ans: (B) $\frac{\pi}{2}$

---

11. $\cos^{-1}\frac{4}{5}+\cos^{-1}\frac{5}{13}=$

$\sqrt{1-x^2}=\frac{3}{5},\ \sqrt{1-y^2}=\frac{12}{13}$

Here $x+y\geq 0$.

$xy-\sqrt{1-x^2}\sqrt{1-y^2}=\frac{4}{5}\cdot\frac{5}{13}-\frac{3}{5}\cdot\frac{12}{13}=-\frac{16}{65}$

So the formula gives $\cos^{-1}\left(-\frac{16}{65}\right)$.

Ans: (D) $\cos^{-1}\left(-\frac{16}{65}\right)$

---

12. $\tan^{-1}\frac{1}{7}+\tan^{-1}\frac{1}{3}=$

Here $xy=\frac{1}{21}<1$.

$\frac{x+y}{1-xy}=\frac{\frac{10}{21}}{\frac{20}{21}}=\frac{1}{2}$

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

Ans: (B) $\tan^{-1}\frac{1}{2}$

---

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

Here $xy=-\frac{1}{6}>-1$.

$\frac{x-y}{1+xy}=\frac{\frac{5}{6}}{\frac{5}{6}}=1$

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

Ans: (C) $\frac{\pi}{4}$

---

14. $\tan^{-1}\frac{1}{2}+\tan^{-1}\frac{1}{3}+\tan^{-1}\frac{1}{7}=$

$S_1=\frac{41}{42},\ S_2=\frac{2}{7},\ S_3=\frac{1}{42}$

$\tan^{-1}\frac{S_1-S_3}{1-S_2}=\tan^{-1}\frac{4}{3}$

Ans: (D) $\tan^{-1}\frac{4}{3}$

---

15. $\sin^{-1}\left(-\frac{5}{13}\right)$ written as an inverse cosine is

$x<0$, so $\sin^{-1}x=-\cos^{-1}\sqrt{1-x^2}=-\cos^{-1}\frac{12}{13}$.

Ans: (B) $-\cos^{-1}\frac{12}{13}$

---

16. $\cos^{-1}\frac{20}{29}$ written as an inverse tangent is

$\cos\theta=\frac{20}{29}$, $\sin\theta=\frac{21}{29}$, so $\tan\theta=\frac{21}{20}$.

Ans: (A) $\tan^{-1}\frac{21}{20}$

---

17. $2\tan^{-1}\frac{2}{3}$ written as a single inverse cosine is

$\frac{1-x^2}{1+x^2}=\frac{5}{13}$

For $x\geq 0$, $2\tan^{-1}x=\cos^{-1}\frac{1-x^2}{1+x^2}$.

Ans: (C) $\cos^{-1}\frac{5}{13}$

---

18. $2\tan^{-1}6$ written as a single inverse tangent is

Use $2\tan^{-1}x = \pi + \tan^{-1}\frac{2x}{1-x^2}$ for $x > 1$.

$\frac{2x}{1-x^2} = -\frac{12}{35}$

Ans: (D) $\pi - \tan^{-1}\frac{12}{35}$

---

19. The graph of $y = \cot^{-1}x$ passes through

This follows from the shape of the graph described in the lesson on graphs.

Ans: (A) $\left(0, \frac{\pi}{2}\right)$

---

20. $\tan^{-1}(\tan 4) =$

4 lies outside $\left(-\frac{\pi}{2}, \frac{\pi}{2}\right)$; bring it into the range using the periodic graph.

The value is $4 - \pi$.

Ans: (A) $4 - \pi$

---

21. $\cos^{-1}(\cos 6) =$

6 lies outside $[0, \pi]$; bring it into the range using the periodic graph.

The value is $-6 + 2\pi$.

Ans: (C) $-6 + 2\pi$

---

22. For $x < 0$, $\cos^{-1}\frac{1-x^2}{1+x^2} =$

Put $x = \tan\theta$, so that the expression inside is a ratio of 2θ.

For $x < 0$ the angle has to be brought back into the principal range.

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

Ans: (D) $-2\tan^{-1}x$

---

23. If $\cos^{-1}x + \cos^{-1}y = \frac{\pi}{6}$, then $\sin^{-1}x + \sin^{-1}y =$

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

Ans: (B) $\frac{5\pi}{6}$

---

24. $\tan^{-1}\frac{2}{9} + \tan^{-1}\frac{7}{11} =$

Standard result: $\tan^{-1}\frac{p}{q} + \tan^{-1}\frac{q-p}{q+p} = \frac{\pi}{4}$.

Ans: (D) $\frac{\pi}{4}$

---

25. To remove the root in $\sqrt{9+x^2}$, use

$9 + 9\tan^2\theta = 9\sec^2\theta$.

Ans: (D) the tangent substitution $x = 3\tan\theta$
