EXPRESSWALA ACADEMY

Maths 1A: Inverse Trigonometric Functions

MCQ Test, Set 06

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 $\sin^{-1}(4x-1)$ is

A. $[0, \frac{1}{2}]$ **B.** $[-\frac{1}{2}, 0]$

C. $[-\frac{1}{4}, \frac{1}{4}]$ **D.** $[0, 2]$

2. The principal value of $\cos^{-1} 0$ is

A. 0 **B.** $\frac{3\pi}{2}$ **C.** $\frac{\pi}{2}$ **D.** $-\frac{\pi}{2}$

3. The principal value of $\sec^{-1} 1$ is

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

4. $\sec^{-1}\left(\sec\frac{2\pi}{5}\right) =$

A. $\frac{\pi}{10}$ **B.** $-\frac{2\pi}{5}$ **C.** $\frac{3\pi}{5}$ **D.** $\frac{2\pi}{5}$

5. $\cos\left(\cos^{-1}\frac{1}{3}\right) =$

A. $-\frac{1}{3}$ **B.** $\frac{1}{3}$ **C.** $\frac{2}{3}$ **D.** 3

6. If $\operatorname{cosec}^{-1}\frac{5}{2} = \alpha$, then $\operatorname{cosec}^{-1}\left(-\frac{5}{2}\right) =$

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

7. If $\cot^{-1}\frac{3}{10} = \alpha$, then $\cot^{-1}\left(-\frac{3}{10}\right) =$

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

8. $\cot^{-1}\left(-\frac{6}{5}\right)$ in terms of an inverse tangent is

A. $\tan^{-1}\frac{5}{6}$ **B.** $\pi - \tan^{-1}\frac{5}{6}$

C. $\pi + \tan^{-1}\frac{5}{6}$ **D.** $\frac{\pi}{2} - \sin^{-1}\frac{6}{5}$

9. If $\sec^{-1} x = \frac{3\pi}{7}$, then $\operatorname{cosec}^{-1} x =$

A. $\frac{4\pi}{7}$ **B.** $\frac{\pi}{14}$ **C.** $-\frac{3\pi}{7}$ **D.** $\frac{3\pi}{7}$

10. $\operatorname{cosec}^{-1}(-3) + \sec^{-1}(-3) =$

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

11. $\cos^{-1}\frac{3}{5}+\cos^{-1}\frac{12}{13}=$

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

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

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12. $\tan^{-1}\frac{5}{3}-\tan^{-1}\frac{1}{4}=$

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

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13. $\tan^{-1}(-2)+\tan^{-1}(-3)=$

A. $\frac{7\pi}{4}$ **B.** $\frac{5\pi}{4}$ **C.** $-\frac{3\pi}{4}$ **D.** $\frac{3\pi}{4}$

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14. $\tan^{-1}\frac{1}{3}+\tan^{-1}\frac{1}{5}+\tan^{-1}\frac{1}{8}=$

A. $\tan^{-1}\frac{79}{104}$ **B.** $\tan^{-1}\frac{3}{4}$

C. $\tan^{-1}\frac{79}{120}$ **D.** $\tan^{-1}\frac{39}{68}$

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15. $\sin^{-1}\left(-\frac{24}{25}\right)$ written as an inverse cosine is

A. $-\cos^{-1}\frac{7}{25}$ **B.** $-\cos^{-1}\frac{24}{25}$

C. $\cos^{-1}\frac{7}{25}$ **D.** $\cos^{-1}\left(-\frac{7}{25}\right)$

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16. $\cos^{-1}\frac{12}{13}$ written as an inverse tangent is

A. $\tan^{-1}\frac{5}{13}$ **B.** $\tan^{-1}\frac{12}{5}$

C. $\tan^{-1}\frac{5}{12}$ **D.** $\pi-\tan^{-1}\frac{5}{12}$

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17. $2\tan^{-1}\frac{2}{9}$ written as a single inverse sine is

A. $\pi-\sin^{-1}\frac{36}{85}$ **B.** $\cos^{-1}\frac{36}{85}$

C. $\sin^{-1}\frac{77}{85}$ **D.** $\sin^{-1}\frac{36}{85}$

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18. $2\tan^{-1}\frac{5}{3}$ written as a single inverse cosine is

A. $\cos^{-1}\frac{15}{17}$ **B.** $\cos^{-1}\frac{8}{17}$

C. $\cos^{-1}\left(-\frac{8}{17}\right)$ **D.** $-\cos^{-1}\left(-\frac{8}{17}\right)$

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19. The graph of $y=\cos^{-1}x$ is the reflection in $y=x$ of

A. the line $y=-x$ **B.** $y=\cos x$ on $[0,\pi]$

C. $y=\cos x$ on $[0,2\pi]$ **D.** $y=\cos x$ on $\left[-\frac{\pi}{2},\frac{\pi}{2}\right]$

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20. $\sec^{-1}\left(\sec\frac{7\pi}{4}\right)=$

A. $\frac{7\pi}{4}$ **B.** $\frac{\pi}{4}$ **C.** $-\frac{\pi}{4}$ **D.** $\frac{3\pi}{4}$

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21. $\operatorname{cosec}^{-1}\left(\operatorname{cosec}\frac{7\pi}{6}\right)=$

A. $-\frac{\pi}{6}$ **B.** $\frac{\pi}{6}$ **C.** $\frac{5\pi}{6}$ **D.** $\frac{7\pi}{6}$

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22. For $\frac{1}{2}\le x\le 1$, $\sin^{-1}(3x-4x^3)=$

A. $-(\pi-3\sin^{-1}x)$ **B.** $\pi-3\sin^{-1}x$

C. $3\sin^{-1}x$ **D.** $-(\pi+3\sin^{-1}x)$

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23. If $\tan^{-1}\frac{3}{x}+\tan^{-1}\frac{27}{x}=\frac{\pi}{2}$, $x>0$, then $x=$

A. 81 **B.** 30 **C.** $3\sqrt{82}$ **D.** 9

24. If $\sin^{-1}\frac{12}{x}+\sin^{-1}\frac{35}{x}=\frac{\pi}{2}$, $x>0$, then $x=$

A. 47 **B.** 37 **C.** $\sqrt{1081}$ **D.** $2\sqrt{105}$

25. To remove the root in $\sqrt{100+x^2}$, use

A. the cosine substitution $x=10\cos\theta$ **B.** the secant substitution $x=10\sec\theta$

C. the sine substitution $x=10\sin\theta$ **D.** the tangent substitution $x=10\tan\theta$

Key sheet

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

Solutions

1. The domain of $\sin^{-1}(4x-1)$ is

$-1 \le 4x-1 \le 1 \Rightarrow 0 \le x \le \frac{1}{2}$

Ans: (A) $[0, \frac{1}{2}]$

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2. The principal value of $\cos^{-1} 0$ is

The angle in $[0, \pi]$ with $\cos\theta = 0$ is $\frac{\pi}{2}$.

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

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3. The principal value of $\sec^{-1} 1$ is

The angle in $\left[0, \frac{\pi}{2}\right) \cup \left(\frac{\pi}{2}, \pi\right]$ with $\sec\theta = 1$ is 0.

Ans: (A) 0

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4. $\sec^{-1}\left(\sec\frac{2\pi}{5}\right) =$

$\frac{2\pi}{5}$ is in $\left[0, \frac{\pi}{2}\right) \cup \left(\frac{\pi}{2}, \pi\right]$, so the value is $\frac{2\pi}{5}$ itself.

Ans: (D) $\frac{2\pi}{5}$

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5. $\cos\left(\cos^{-1}\frac{1}{3}\right) =$

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

Ans: (B) $\frac{1}{3}$

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6. If $\operatorname{cosec}^{-1}\frac{5}{2} = \alpha$, then $\operatorname{cosec}^{-1}\left(-\frac{5}{2}\right) =$

$\operatorname{cosec}^{-1}(-x) = -\operatorname{cosec}^{-1} x$

$\operatorname{cosec}^{-1}\left(-\frac{5}{2}\right) = -\alpha$

Ans: (D) $-\alpha$

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7. If $\cot^{-1}\frac{3}{10} = \alpha$, then $\cot^{-1}\left(-\frac{3}{10}\right) =$

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

$\cot^{-1}\left(-\frac{3}{10}\right) = \pi - \alpha$

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

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8. $\cot^{-1}\left(-\frac{6}{5}\right)$ in terms of an inverse tangent is

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

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

Ans: (B) $\pi - \tan^{-1}\frac{5}{6}$

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9. If $\sec^{-1} x = \frac{3\pi}{7}$, then $\operatorname{cosec}^{-1} x =$

$\operatorname{cosec}^{-1} x = \frac{\pi}{2} - \frac{3\pi}{7} = \frac{\pi}{14}$

Ans: (B) $\frac{\pi}{14}$

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10. $\operatorname{cosec}^{-1}(-3) + \sec^{-1}(-3) =$

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

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

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11. $\cos^{-1}\frac{3}{5}+\cos^{-1}\frac{12}{13}=$

$\sqrt{1-x^2}=\frac{4}{5},\ \sqrt{1-y^2}=\frac{5}{13}$

Here $x+y\geq 0$.

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

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

Ans: (A) $\cos^{-1}\frac{16}{65}$

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12. $\tan^{-1}\frac{5}{3}-\tan^{-1}\frac{1}{4}=$

Here $xy=\frac{5}{12}>-1$.

$\frac{x-y}{1+xy}=\frac{\frac{17}{12}}{\frac{17}{12}}=1$

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

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

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13. $\tan^{-1}(-2)+\tan^{-1}(-3)=$

Here $x,y<0,\ xy=6>1$.

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

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

Ans: (C) $-\frac{3\pi}{4}$

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14. $\tan^{-1}\frac{1}{3}+\tan^{-1}\frac{1}{5}+\tan^{-1}\frac{1}{8}=$

$S_1=\frac{79}{120},\ S_2=\frac{2}{15},\ S_3=\frac{1}{120}$

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

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

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15. $\sin^{-1}\left(-\frac{24}{25}\right)$ written as an inverse cosine is

$x<0$, so $\sin^{-1}x=-\cos^{-1}\sqrt{1-x^2}=-\cos^{-1}\frac{7}{25}$.

Ans: (A) $-\cos^{-1}\frac{7}{25}$

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16. $\cos^{-1}\frac{12}{13}$ written as an inverse tangent is

$\cos\theta=\frac{12}{13}$, $\sin\theta=\frac{5}{13}$, so $\tan\theta=\frac{5}{12}$.

Ans: (C) $\tan^{-1}\frac{5}{12}$

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17. $2\tan^{-1}\frac{2}{9}$ written as a single inverse sine is

$\frac{2x}{1+x^2}=\frac{36}{85}$

For $x\leq 1$ the formula is $\sin^{-1}\frac{2x}{1+x^2}$.

Ans: (D) $\sin^{-1}\frac{36}{85}$

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18. $2\tan^{-1}\frac{5}{3}$ written as a single inverse cosine is

$\frac{1-x^2}{1+x^2}=-\frac{8}{17}$

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

Ans: (C) $\cos^{-1}\left(-\frac{8}{17}\right)$

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19. The graph of $y = \cos^{-1} x$ is the reflection in $y = x$ of

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

Ans: (B) $y = \cos x$ on $[0, \pi]$

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20. $\sec^{-1}\left(\sec \frac{7\pi}{4}\right) =$

$\frac{7\pi}{4}$ lies outside $\left[0, \frac{\pi}{2}\right) \cup \left(\frac{\pi}{2}, \pi\right]$; bring it into the range using the periodic graph.
The value is $\frac{\pi}{4}$.

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

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21. $\operatorname{cosec}^{-1}\left(\operatorname{cosec} \frac{7\pi}{6}\right) =$

$\frac{7\pi}{6}$ lies outside $\left[-\frac{\pi}{2}, 0\right) \cup \left(0, \frac{\pi}{2}\right]$; bring it into the range using the periodic graph.
The value is $-\frac{\pi}{6}$.

Ans: (A) $-\frac{\pi}{6}$

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22. For $\frac{1}{2} \le x \le 1$, $\sin^{-1}(3x - 4x^3) =$

Put $x = \sin\theta$, so that the expression inside is a ratio of 3θ.
For $\frac{1}{2} \le x \le 1$ the angle has to be brought back into the principal range.
$\sin^{-1}(3x - 4x^3) = \pi - 3\sin^{-1} x$

Ans: (B) $\pi - 3\sin^{-1} x$

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23. If $\tan^{-1}\frac{3}{x} + \tan^{-1}\frac{27}{x} = \frac{\pi}{2}$, $x > 0$, then $x =$

The product of the two values must be 1: $x^2 = 81$.

Ans: (D) 9

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24. If $\sin^{-1}\frac{12}{x} + \sin^{-1}\frac{35}{x} = \frac{\pi}{2}$, $x > 0$, then $x =$

$x = \sqrt{12^2 + 35^2} = 37$.

Ans: (B) 37

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25. To remove the root in $\sqrt{100 + x^2}$, use

$100 + 100\tan^2\theta = 100\sec^2\theta$.

Ans: (D) the tangent substitution $x = 10\tan\theta$
