EXAM-DAY · 90-MIN REVISION CARD

Inverse Trigonometric Functions

Print this · Fold it · Carry to the exam-hall gate · Revise once · Then walk in.

FORMULAS & KEY RESULTS

- $\sin^{-1}$: domain $[-1, 1] \to$ range $[-\pi/2, \pi/2]$
- $\cos^{-1}$: domain $[-1, 1] \to$ range $[0, \pi]$
- $\tan^{-1}$: domain $\mathbb{R} \to$ range $(-\pi/2, \pi/2)$
- $\cot^{-1}$: domain $\mathbb{R} \to$ range $(0, \pi)$
- $\sec^{-1}$: domain $|x| \geqslant 1 \to$ range $[0, \pi] - \{\pi/2\}$
- $\operatorname{cosec}^{-1}$: domain $|x| \geqslant 1 \to$ range $[-\pi/2, \pi/2] - \{0\}$
- $\sin^{-1}(-x) = -\sin^{-1} x$
- $\cos^{-1}(-x) = \pi - \cos^{-1} x$
- $\tan^{-1}(-x) = -\tan^{-1} x$
- $\sin^{-1} x + \cos^{-1} x = \pi/2$
- $\tan^{-1} x + \cot^{-1} x = \pi/2$
- $\sec^{-1} x + \operatorname{cosec}^{-1} x = \pi/2$
- $2\tan^{-1} x = \tan^{-1}(2x/(1-x^2))$, $|x| < 1$
- $2\tan^{-1} x = \sin^{-1}(2x/(1+x^2))$, $|x| \leqslant 1$
- $2\tan^{-1} x = \cos^{-1}((1-x^2)/(1+x^2))$, $x \geqslant 0$
- $\tan^{-1} x + \tan^{-1} y = \tan^{-1}((x+y)/(1-xy))$, $xy < 1$
- $\tan^{-1} x - \tan^{-1} y = \tan^{-1}((x-y)/(1+xy))$
- Standard: $\sin^{-1}(1/2)=\pi/6$, $\sin^{-1}(\sqrt{3}/2)=\pi/3$, $\cos^{-1}(1/2)=\pi/3$, $\tan^{-1}(1)=\pi/4$, $\tan^{-1}(\sqrt{3})=\pi/3$

TOP 5 PYQ PATTERNS

1 Principal value of $\sin^{-1}$/$\cos^{-1}$/$\tan^{-1}$ at standard input
2 marks · 95% of years
State range → let θ = answer → verify θ in range

2 $\sin^{-1}(\sin x)$ or $\cos^{-1}(\cos x)$ where x outside principal range
2 marks · 70% of years
Check x ∈ range; if not, reduce using $\sin(\pi - x) = \sin x$ or $\cos(2\pi - x) = \cos x$; find equivalent in range

3 Prove identity $\sin^{-1} + \cos^{-1} = \pi/2$ etc.
3 marks · 55% of years
Substitute let A = $\sin^{-1} x$, use $\sin(\pi/2 - A) = \cos A$ trick

4 Sum $\tan^{-1} x + \tan^{-1} y$ with $xy > 1$ case
3 marks · 40% of years
Check xy sign; add or subtract π when $xy > 1$; box final

5 $2\tan^{-1} x$ identity simplification
3 marks · 30% of years
Verify $|x| < 1$; substitute into $2x/(1-x^2)$; simplify carefully

90-MIN REVISION FLOW

0–15 min
Memorise the 6 principal-value table; recite domain → range mapping

15–35 min
Drill 10 standard-input MCQs ($\sin^{-1}(1/2)$, $\cos^{-1}(-1/2)$, $\tan^{-1}(\sqrt{3})$, etc.)

35–55 min
Practice 3 reduction problems $\sin^{-1}(\sin(7\pi/6))$ style

55–75 min
Solve one 3-mark proof identity + one 3-mark $\tan^{-1}$ sum problem

75–90 min
Review the 7 misconceptions; redo any errors; sleep on it

Confidence, not anxiety. You've practised this all year. Trust your steps. Don't change strategy on exam morning.
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