3.4 Differentiating Inverse Trigonometric Functions

Name: _____ Class: _____ Date: _____ **Total: 9 marks**

KEY WORDS inverse trigonometric functions

Objective

Build the skills to answer exam questions on **differentiating inverse trigonometric functions**.

You must be able to:

- state and use the derivatives of $\arcsin x$, $\arccos x$, and $\arctan x$

1 Key knowledge and worked examples

Study these first. Each one shows the method for a question type used later.

■ **Inverse trig derivatives**

$$\frac{d}{dx}[\arcsin x] = \frac{1}{\sqrt{1-x^2}}, \quad \frac{d}{dx}[\arccos x] = -\frac{1}{\sqrt{1-x^2}},$$

$$\frac{d}{dx}[\arctan x] = \frac{1}{1+x^2}.$$

2 Practice

2.1 State $\frac{d}{dx}[\arcsin x]$. [1]

2.2 State $\frac{d}{dx}[\arctan x]$. [1]

2.3 State $\frac{d}{dx}[\arccos x]$. [2]

3 Exam-style questions

3.1 $\frac{d}{dx}[\arctan x]$ equals [1]

- [ ] **A** $\frac{1}{\sqrt{1-x^2}}$
  B $\frac{1}{1+x^2}$
  C $-\frac{1}{1+x^2}$
  D $\frac{1}{x}$

3.2 $\frac{d}{dx}[\arcsin x]$ equals [1]

- [ ] **A** $\frac{1}{1+x^2}$
  B $\frac{1}{\sqrt{1-x^2}}$
  C $-\frac{1}{\sqrt{1-x^2}}$
  D $\arccos x$

3.3 Differentiate each.

(a) $\arcsin x$. [1]

(b) $\arctan x$. [1]

(c) $\arccos x$. [1]

Solutions

Each answer shows the steps, then the **result**.

2.1

- $\dfrac{1}{\sqrt{1-x^2}}$

2.2

- $\dfrac{1}{1+x^2}$

2.3

- $-\dfrac{1}{\sqrt{1-x^2}}$

3.1 B

- $\dfrac{1}{1+x^2}$.

3.2 B

- $\dfrac{1}{\sqrt{1-x^2}}$.

3.3

(a)

- $\dfrac{1}{\sqrt{1-x^2}}$

(b)

- $\dfrac{1}{1+x^2}$

(c)

- $-\dfrac{1}{\sqrt{1-x^2}}$