AP CALCULUS AB • EXERCISE SHEET

3.4 Differentiating Inverse Trigonometric Functions

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

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 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]

4 Go further

- work through the **3.4 Differentiating Inverse Trigonometric Functions** lesson on the **Learn** page;
- read the **Differentiation: Composite, Implicit, and Inverse Functions** section of the AP Calculus AB handout on the **Know** page.

Solutions

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**.

3.2 **B**.

3.3 (a) $\dfrac{1}{\sqrt{1-x^2}}$. (b) $\dfrac{1}{1+x^2}$. (c) $-\dfrac{1}{\sqrt{1-x^2}}$.