

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

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- 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 BC handout on the **Know** page.

Solutions

2.1 $\frac{1}{\sqrt{1-x^2}}.$

2.2 $\frac{1}{1+x^2}.$

2.3 $-\frac{1}{\sqrt{1-x^2}}.$

3.1 B.

3.2 B.

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