

2.10 Derivatives of $\tan x$, $\cot x$, $\sec x$, and $\csc x$

Name: _____ Class: _____ Date: _____

Total: 9 marks

KEY WORDS trigonometric functions 三角函数 • derivative 导数

Objective

Build the skills to answer exam questions on **the derivatives of tangent, cotangent, secant, and cosecant**.

You must be able to:

- state and use the derivatives of the four remaining **trigonometric functions** 三角函数

1 Worked examples

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

■ More trig derivatives

$$\frac{d}{dx}[\tan x] = \sec^2 x, \quad \frac{d}{dx}[\cot x] = -\csc^2 x,$$

$$\frac{d}{dx}[\sec x] = \sec x \tan x, \quad \frac{d}{dx}[\csc x] = -\csc x \cot x.$$

2 Practice

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

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

2.3 State $\frac{d}{dx}[\cot x]$ and $\frac{d}{dx}[\csc x]$. [2]

3 Exam-style questions

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

- | | |
|---|-----------------|
| A | $\sec^2 x$ |
| B | $-\csc^2 x$ |
| C | $\sec x \tan x$ |
| D | $-\sin x$ |

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

- | | |
|---|------------------|
| A | $\sec^2 x$ |
| B | $\sec x \tan x$ |
| C | $-\csc x \cot x$ |
| D | $\tan x$ |

3.3 Differentiate each.

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

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

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