3.11 The Secant, Cosecant, and Cotangent Functions

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

KEY WORDS reciprocal functions

Objective

Build the skills to answer exam questions on **the secant, cosecant, and cotangent functions**.

You must be able to:

- write sec, csc, and cot as **reciprocal functions** of cos, sin, and tan

1 Key knowledge and worked examples

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

■ **Reciprocal functions**

$$\sec x = \frac{1}{\cos x}, \quad \csc x = \frac{1}{\sin x}, \quad \cot x = \frac{\cos x}{\sin x} = \frac{1}{\tan x}.$$

Each is undefined where its denominator is 0.

■ **Example**

$\sec 0 = \dfrac{1}{\cos 0} = 1$; $\csc \frac{\pi}{2} = \dfrac{1}{\sin(\pi/2)} = 1$.

2 Practice

2.1 State $\sec x$ in terms of $\cos x$. [1]

2.2 State $\csc x$ in terms of $\sin x$. [1]

2.3 Evaluate $\sec 0$ and $\csc \frac{\pi}{2}$. [2]

3 Exam-style questions

3.1 $\sec x$ equals [1]

- ☐ **A** $1/\sin x$
- **B** $1/\cos x$
- **C** $1/\tan x$
- **D** $\cos x$

3.2 $\cot x$ equals [1]

- ☐ **A** $\sin x/\cos x$
- **B** $\cos x/\sin x$
- **C** $1/\sin x$
- **D** $\tan x$

3.3 Answer each.

(a) Evaluate $\sec 0$. [1]

(b) Evaluate $\csc \frac{\pi}{2}$. [1]

(c) State where $\csc x$ is undefined. [1]

Solutions

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

2.1

- $\sec x = 1/\cos x$

2.2

- $\csc x = 1/\sin x$

2.3

- $\sec 0 = 1$; $\csc \frac{\pi}{2} = 1$

3.1 B

- $1/\cos x$.

3.2 B

- $\cos x/\sin x$.

3.3

(a)

- 1

(b)

- 1

(c)

- where $\sin x = 0$ (i.e. $x = n\pi$)