

Exercise walk-through

The Secant, Cosecant, and Cotangent Functions ■ 3.11

eXercise

You must be able to

- write $\sec$, $\csc$, and $\cot$ as **reciprocal functions** 倒数函数 of $\cos$, $\sin$, and $\tan$

Method — 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.

Method — Example

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

Practice 2.1 ■ 1 mark

State $\sec x$ in terms of $\cos x$.

Solution 2.1

Worked steps

$$\sec x = 1/\cos x \quad \text{B1}.$$

Practice 2.2 ■ 1 mark

State $\csc x$ in terms of $\sin x$.

Solution 2.2

Worked steps

$$\csc x = 1/\sin x \quad \text{B1}.$$

Practice 2.3 ■ 2 marks

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

Solution 2.3

Worked steps

$$\sec 0 = 1; \csc \frac{\pi}{2} = 1 \quad \text{B1 B1}.$$

Exam-style 3.1 ■ 1 mark

$\sec x$ equals

A $1/\sin x$

B $1/\cos x$

C $1/\tan x$

D $\cos x$

Solution 3.1

A $1/\sin x$

B $1/\cos x$



C $1/\tan x$

D $\cos x$

Worked steps

B.

Exam-style 3.2 ■ 1 mark

$\cot x$ equals

A $\sin x / \cos x$

B $\cos x / \sin x$

C $1 / \sin x$

D $\tan x$

Solution 3.2

A $\sin x / \cos x$

B $\cos x / \sin x$



C $1 / \sin x$

D $\tan x$

Worked steps

B.

Exam-style 3.3 ■ 1 mark

Answer each.

- (a) Evaluate $\sec 0$.
- (b) Evaluate $\csc \frac{\pi}{2}$.
- (c) State where $\csc x$ is undefined.

Solution 3.3

Method: Reciprocal functions

Worked steps

(a) 1 **B1**. (b) 1 **B1**. (c) where $\sin x = 0$ (i.e. $x = n\pi$) **B1**.