

Exercise walk-through

Finding the Derivatives of Tangent, Cotangent, Secant, and/or Cosecant Functions

▪ 2.10

eXercise

You must be able to

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

Method — More trig derivatives

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

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

Practice 2.1 ■ 1 mark

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

Solution 2.1

Worked steps

$$\sec^2 x \text{ (B1).}$$

Practice 2.2 ■ 1 mark

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

Solution 2.2

Worked steps

 $\sec x \tan x$ **B1**.

Practice 2.3 ■ 2 marks

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

Solution 2.3

Worked steps

$$\frac{d}{dx}[\cot x] = -\csc^2 x; \quad \frac{d}{dx}[\csc x] = -\csc x \cot x \quad \text{B1} \quad \text{B1}.$$

Exam-style 3.1 ■ 1 mark

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

A $\sec^2 x$

B $-\csc^2 x$

C $\sec x \tan x$

D $-\sin x$

Solution 3.1

A $\sec^2 x$



B $-\csc^2 x$

C $\sec x \tan x$

D $-\sin x$

Worked steps**A.**

Exam-style 3.2 ■ 1 mark

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

A $\sec^2 x$

B $\sec x \tan x$

C $-\csc x \cot x$

D $\tan x$

Solution 3.2

A $\sec^2 x$

B $\sec x \tan x$ 

C $-\csc x \cot x$

D $\tan x$

Worked steps

B.

Exam-style 3.3 ■ 1 mark

Differentiate each.

(a) $\tan x$.

(b) $\cot x$.

(c) $\csc x$.

Solution 3.3

Worked steps

(a) $\sec^2 x$ **B1**. (b) $-\csc^2 x$ **B1**. (c) $-\csc x \cot x$ **B1**.