

Exercise walk-through

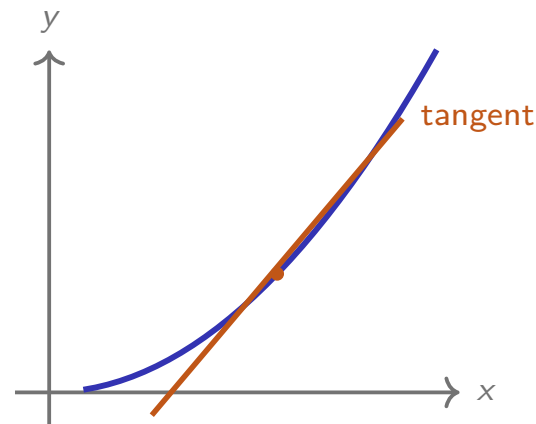
2.10

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

AP Calculus BC

What we will cover

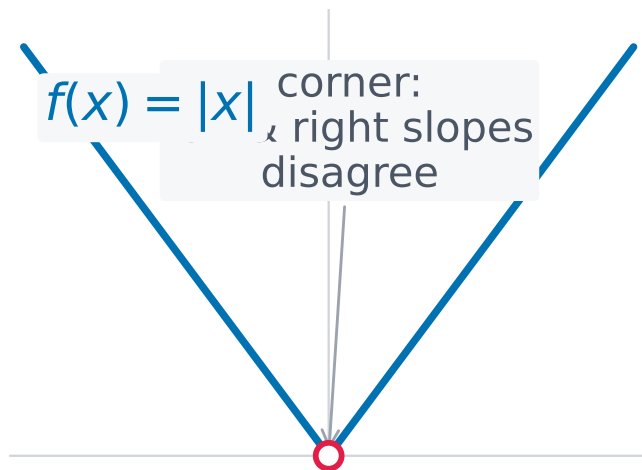
- 1 Average vs instantaneous rate
- 2 The derivative as a limit
- 3 When a derivative exists
- 4 Basic derivative rules
- 5 Product & quotient rules
- 6 Trig, exp & log derivatives



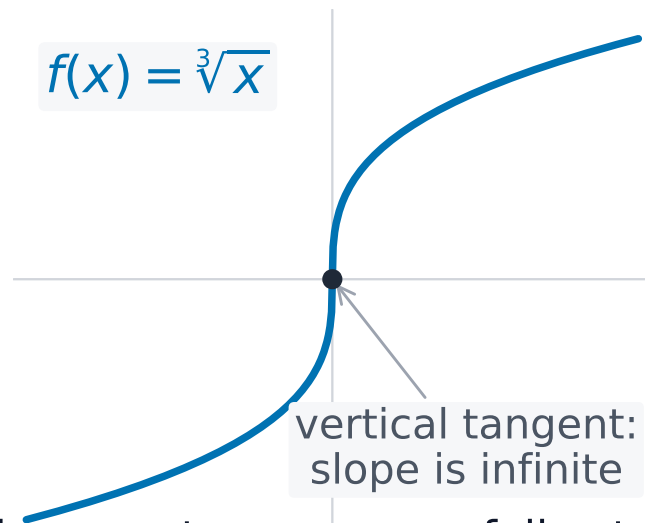
Differentiable $\Rightarrow$ continuous (not the reverse)

If f is **differentiable** at a point, then f is **continuous** there. A continuous function can still **fail** to be differentiable:

continuous, not differentiable continuous, not differentiable



$$f(x) = \sqrt[3]{x}$$



f differentiable at $a \Rightarrow f$ continuous at a ; converse fails at corners and vertical tangents

Use the contrapositive: if f is **not continuous** at a , it is **not differentiable** at a .

Unit 2 – key takeaways

1

The derivative

the limit of the secant slope – the tangent's gradient

2

Existence

differentiable $\Rightarrow$ continuous;
corners and vertical tangents fail

3

The rules

power, constant multiple, sum;
product and quotient

4

Building blocks

$\sin$, $\cos$, e^x , $\ln x$ – know them by heart

Exercises 2.1·2.3

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]

Exercises 2.1–2.3

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

2.1

- $\sec^2 x$

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

2.2

- $\sec x \tan x$

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

2.3

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

Exercises 3.1·3.2

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 $\tan x$

Exercises 3.1-3.2

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

[1]

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

3.1 A

- $\sec^2 x$.

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

[1]

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

3.2 B

- $\sec x \tan x$.

Exercise 3.3 (a)

3.3 Differentiate each.

(a) $\tan x$.

[1]

Exercise 3.3 (a)

3.3 Differentiate each.

(a) $\tan x$.

[1]

(a)

- $\sec^2 x$

Exercise 3.3 (b)

3.3 Differentiate each.

(b) $\cot x$.

[1]

Exercise 3.3 (b)

3.3 Differentiate each.

(b) $\cot x$.

[1]

(b)

- $-\csc^2 x$

Exercise 3.3 (c)

3.3 Differentiate each.

(c) $\csc x$.

[1]

Exercise 3.3 (c)

3.3 Differentiate each.

(c) $\csc x$.

[1]

(c)

- $-\csc x \cot x$