

Exercise walk-through

Rates of Change in Linear and Quadratic Functions ■ 1.3

eXercise

You must be able to

- explain that a **linear function** 线性函数 has a **constant** average rate of change
- explain that a **quadratic function's** 二次函数 average rates of change follow a **linear** pattern

Method — Linear functions

Over **any** interval, a linear function has the **same** (constant) average rate of change — its slope.

Method — Quadratic functions

For a quadratic, the average rates of change over **consecutive equal-length** intervals are **not** constant, but they change in a **linear** pattern (a constant second difference).

Method — Example

A linear function with $f(0) = 1$, $f(2) = 7$: $\text{AROC} = \frac{7 - 1}{2 - 0} = 3$ over every interval.

Practice 2.1 ■ 1 mark

State the average-rate-of-change property of a linear function.

Solution 2.1

Method: Linear functions

Worked steps

it is constant over any interval **B1**.

Practice 2.2 ■ 1 mark

State how the average rates of change of a quadratic behave over equal intervals.

Solution 2.2

Method: Quadratic functions

Worked steps

they change in a linear pattern **B1**.

Practice 2.3 ■ 2 marks

A linear function has $f(0) = 1$ and $f(2) = 7$. Find its (constant) average rate of change.

Solution 2.3

Method: Linear functions

Worked steps

$$\frac{7-1}{2-0} = 3 \quad \text{M1} \quad \text{A1}.$$

Exam-style 3.1 ■ 1 mark

A linear function has an average rate of change that is

A always increasing

B constant

C always zero

D quadratic

Solution 3.1

Method: Linear functions

A always increasing

B constant 

C always zero

D quadratic

Worked steps

B.

Exam-style 3.2 ■ 1 mark

For a quadratic, the average rates of change over equal intervals form a

A constant sequence

B linear pattern

C quadratic pattern

D random sequence

Solution 3.2

Method: Quadratic functions

A constant sequence

B linear pattern



C quadratic pattern

D random sequence

Worked steps

B.

Exam-style 3.3 ■ 2 marks

A linear function passes through $(1, 4)$ and $(3, 10)$.

- (a) Find the average rate of change.
- (b) State whether it changes over other intervals.

Solution 3.3

Method: Linear functions

Worked steps

(a) $\frac{10 - 4}{3 - 1} = 3$ **M1** **A1**. (b) no — it is constant **B1**.