

1.3 Rates of Change in Linear and Quadratic Functions

Name: _____ Class: _____ Date: _____

Total: 9 marks

Objective

Build the skills to answer exam questions on **rates of change in linear and quadratic functions**.

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

1 Worked examples

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

■ Linear functions

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

■ 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).

■ Example

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

2 Practice

2.1 State the average-rate-of-change property of a linear function. [1]

2.2 State how the average rates of change of a quadratic behave over equal intervals. [1]

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

3 Exam-style questions

3.1 A linear function has an average rate of change that is [1]

- **A** always increasing
 - **B** constant
 - **C** always zero
 - **D** quadratic
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3.2 For a quadratic, the average rates of change over equal intervals form a [1]

- **A** constant sequence
 - **B** linear pattern
 - **C** quadratic pattern
 - **D** random sequence
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3.3 A linear function passes through $(1, 4)$ and $(3, 10)$.

(a) Find the average rate of change. [2]

(b) State whether it changes over other intervals. [1]

4 Go further

- work through the **1.3 Rates of Change in Linear and Quadratic Functions** lesson on the **Learn** page;
- read the **Polynomial and Rational Functions** section of the AP Precalculus hand-out on the **Know** page.

Solutions

2.1 it is constant over any interval.

2.2 they change in a linear pattern.

2.3 $\frac{7-1}{2-0} = 3.$

3.1 B.

3.2 B.

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