AP PRECALCULUS • EXERCISE SHEET

1.3 Rates of Change in Linear and Quadratic Functions

Name: _____ Class: _____ Date: _____ **Total: 9 marks**

KEY WORDS linear function 线性函数 • quadratic 二次 • quadratic function's 二次函数 • zero 零点 • function 函数

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 $f(0) = 1$, $f(2) = 7$: $\text{AROC} = \dfrac{7-1}{2-0} = 3$ 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 B C D

A always increasing
B constant
C always zero
D quadratic

3.2 For a quadratic, the average rates of change over equal intervals form a [1]

A B C D

A constant sequence
B linear pattern
C quadratic pattern
D random sequence

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]