AP CALCULUS BC • EXERCISE SHEET

4.1 Interpreting the Meaning of the Derivative in Context

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

Objective

Build the skills to answer exam questions on **interpreting the meaning of the derivative in context**.

You must be able to:

- give the **units** 单位 of a derivative
- interpret its sign and value in a real context

1 Worked examples

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

■ The derivative in context

A derivative is a **rate of change** with units: if $V(t)$ is a volume in cm^3 at time t (s), then $V'(t)$ is in cm^3/s.

- $f'(t) > 0$: the quantity is increasing;
- $f'(t) < 0$: it is decreasing.

2 Practice

2.1 State the units of $f'(t)$ if f is in metres and t in seconds. [1]

2.2 State what a positive derivative means. [1]

2.3 If $P(t)$ is a population and $P'(5) = 200$, interpret this. [2]

3 Exam-style questions

3.1 If $h(t)$ is a height in m and t in s, then $h'(t)$ has units [1]

- **A** m
- **B** m/s
- **C** s/m
- **D** m $\cdot$ s

3.2 A positive $f'(t)$ means the quantity is [1]

- **A** decreasing
- **B** increasing
- **C** constant
- **D** zero

3.3 $W(t)$ is water in litres at time t (min), and $W'(3) = -4$.

(a) State the units. [1]

(b) State what the sign means. [1]

(c) Interpret $W'(3) = -4$. [1]

4 Go further

- work through the **4.1 Interpreting the Meaning of the Derivative in Context** lesson on the **Learn** page;
- read the **Contextual Applications of Differentiation** section of the AP Calculus BC handout on the **Know** page.

Solutions

2.1 metres per second (m/s).

2.2 the quantity is increasing.

2.3 at $t = 5$, the population is growing at 200 per unit time.

3.1 B.

3.2 B.

3.3 (a) litres per minute (L/min). (b) the amount is decreasing. (c) at $t = 3$ min, the water is falling at 4 L/min.