AP CALCULUS AB • EXERCISE SHEET

4.3 Rates of Change Beyond Motion

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

Objective

Build the skills to answer exam questions on **rates of change in applied contexts other than motion**.

You must be able to:

- interpret a derivative as a rate in any context (e.g. **marginal cost** 边际成本)

1 Worked examples

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

> ■ **Rates in other contexts**
>
> A derivative measures the rate of change of **any** quantity: marginal cost $C'(x)$, a flow rate, a reaction rate. Interpret its sign and units just as for motion.
>
> ■ **Example**
>
> If $C(x)$ is cost in dollars for x items, $C'(100) = 5$ means about \$5 to produce the 101st item.

2 Practice

2.1 State what marginal cost is, as a derivative. [1]

2.2 State the units of $C'(x)$ if C is in dollars and x in items. [1]

2.3 If $C'(100) = 5$, interpret this. [2]

3 Exam-style questions

3.1 Marginal cost is the derivative of [1]

- **A** revenue
- **B** the cost function
- **C** profit
- **D** price

3.2 If $A'(t) > 0$, the area A is [1]

- **A** shrinking
- **B** growing
- **C** constant
- **D** zero

3.3 $C(x)$ is cost in dollars for x items, and $C'(50) = 8$.

(a) State the units. [1]

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

(c) Interpret $C'(50) = 8$. [1]

4 Go further

- work through the **4.3 Rates of Change in Applied Contexts Other Than Motion** lesson on the **Learn** page;
- read the **Contextual Applications of Differentiation** section of the AP Calculus AB handout on the **Know** page.

Solutions

2.1 the derivative of the cost function, $C'(x)$.

2.2 dollars per item.

2.3 near $x = 100$ items, cost rises about \$5 per additional item.

3.1 B.

3.2 B.

3.3 (a) dollars per item. (b) cost is rising with output. (c) about \$8 to produce the 51st item.