AP CALCULUS AB • EXERCISE SHEET

2.2 Defining the Derivative and Its Notation

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

Objective

Build the skills to answer exam questions on **defining the derivative and using derivative notation**.

You must be able to:

- write the limit definition of the **derivative** 导数
- use the notations $f'(x)$ and $\dfrac{dy}{dx}$

1 Worked examples

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

■ **The derivative**

$$f'(x) = \lim_{h \to 0} \frac{f(x+h) - f(x)}{h}$$

is the instantaneous rate of change —the slope of the **tangent line** 切线. Notations: $f'(x)$, $\dfrac{dy}{dx}$, $\dfrac{d}{dx}[f(x)]$.

2 Practice

2.1 Write the limit definition of the derivative. [1]

2.2 State two notations for the derivative. [1]

2.3 State what $f'(x)$ measures geometrically. [2]

3 Exam-style questions

3.1 The derivative $f'(x)$ is defined as [1]

- **A** $f(x)/x$
- **B** $\lim_{h\to 0} \dfrac{f(x+h)-f(x)}{h}$
- **C** $f(x)\cdot x$
- **D** $\dfrac{f(b)-f(a)}{b-a}$ only

3.2 $\dfrac{dy}{dx}$ is another notation for the [1]

- **A** integral
- **B** derivative
- **C** limit only
- **D** area

3.3 Answer each.

(a) $f'(a)$ is the slope of the _____ line. [1]

(b) Name the quantity $f'(x)$. [1]

(c) State what $\dfrac{dy}{dx}$ reads as. [1]

4 Go further

- work through the **2.2 Defining the Derivative of a Function and Using Derivative Notation** lesson on the **Learn** page;
- read the **Differentiation: Definition and Fundamental Properties** section of the AP Calculus AB handout on the **Know** page.

Solutions

2.1 $f'(x) = \lim_{h \to 0} \dfrac{f(x+h) - f(x)}{h}$.

2.2 any two of $f'(x)$, $\dfrac{dy}{dx}$, $\dfrac{d}{dx}[f(x)]$.

2.3 the slope of the tangent line to the graph of f at x.

3.1 B.

3.2 B.

3.3 (a) tangent. (b) the derivative (instantaneous rate of change). (c) the rate of change of y with respect to x.