AP CALCULUS AB • EXERCISE SHEET

3.6 Calculating Higher-Order Derivatives

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

KEY WORDS second derivative 二阶导数

Objective

Build the skills to answer exam questions on **higher-order derivatives**.

You must be able to:

- find the **second derivative** 二阶导数 f''
- use the notation $\frac{d^2y}{dx^2}$

1 Worked examples

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

> ■ **Higher-order derivatives**
> The second derivative $f'' = (f')'$ is the derivative of the first derivative. Notation: $f''(x)$, $\frac{d^2y}{dx^2}$.
>
> ■ **Example**
> $f(x) = x^3 \Rightarrow f'(x) = 3x^2 \Rightarrow f''(x) = 6x$.

2 Practice

2.1 State what the second derivative is. [1]

2.2 For $f(x) = x^3$, find f''. [2]

2.3 State the notation for the second derivative. [1]

3 Exam-style questions

3.1 The second derivative is the derivative of [1]

A B
C D

A f
B f'
C the integral
D a constant

3.2 $\frac{d^2y}{dx^2}$ denotes the [1]

A B
C D

A first derivative
B second derivative
C integral
D slope only

3.3 $f(x) = x^4$.

(a) Find f'. [1]

(b) Find f''. [1]

(c) State $f''(1)$. [1]