AP PRECALCULUS • EXERCISE SHEET

2.4 Exponential Function Manipulation

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

KEY WORDS laws of exponents 指数律 • exponential function 指数函数

Objective

Build the skills to answer exam questions on **exponential function manipulation**.

You must be able to:

- apply the **laws of exponents** 指数律 (product, quotient, power)
- rewrite $a \cdot b^{x+c}$ as a constant times b^x

1 Worked examples

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

■ Laws of exponents

$b^{m+n} = b^m \cdot b^n$; $b^{m-n} = \dfrac{b^m}{b^n}$; $(b^m)^n = b^{mn}$.

■ Rewriting a shift as a scaling

$a \cdot b^{x+c} = (a \cdot b^c) \cdot b^x$ — a horizontal shift of an exponential is the same as a vertical scaling.

■ Example

$5 \cdot 2^{x+2} = 5 \cdot 2^2 \cdot 2^x = 20 \cdot 2^x$.

2 Practice

2.1 Simplify $b^3 \cdot b^4$. [1]

2.2 Simplify $(b^2)^5$. [1]

2.3 Rewrite 2^{x+3} as a constant times 2^x. [2]

3 Exam-style questions

3.1 $b^m \cdot b^n$ equals [1]

A B
C D

A b^{mn}
B b^{m+n}
C b^{m-n}
D $b^m + b^n$

3.2 $(b^m)^n$ equals [1]

A B
C D

A b^{m+n}
B b^{mn}
C $b^m \cdot n$
D b^{m-n}

3.3 Rewrite $5 \cdot 2^{x+2}$ as a constant times 2^x.

(a) Split the exponent. [1]

(b) Evaluate 2^2. [1]

(c) Write the result as a constant times 2^x. [1]