

2.10 Inverses of Exponential Functions

Name: _____ Class: _____ Date: _____

Total: 9 marks

KEY WORDS logarithm • exponential function • root

Objective

Build the skills to answer exam questions on **inverses of exponential functions**.

You must be able to:

- use that the inverse of b^x is $\log_b(x)$
- solve an exponential equation by taking a logarithm

1 Key knowledge and worked examples

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

■ Log inverts exponent

The inverse of $f(x) = b^x$ is $f^{-1}(x) = \log_b(x)$. To solve $b^x = y$, take $\log_b$ of both sides: $x = \log_b(y)$.

■ Example

$$2^x = 16 \Rightarrow x = \log_2(16) = 4.$$

2 Practice

2.1 State the inverse of $f(x) = 10^x$. [1]

2.2 Solve $3^x = 81$. [2]

2.3 State the inverse of e^x .

[1]

3 Exam-style questions

3.1 The inverse of $f(x) = b^x$ is

[1]

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A b^{-x}

B $\log_b(x)$

C $1/b^x$

D x^b

3.2 To solve $5^x = 125$, take

[1]

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A $\log_5$ of both sides

B the square root

C the reciprocal

D the derivative

3.3 Solve $2^x = 32$.

(a) Rewrite 32 as a power of 2.

[1]

(b) Equate the exponents.

[1]

(c) State x .

[1]

Solutions

Each answer shows the steps, then the **result**.

2.1

- $f^{-1}(x) = \log_{10}(x)$

2.2

- $3^x = 81 = 3^4$, so $x = 4$

2.3

- $\ln(x)$ (i.e. $\log_e(x)$)

3.1 B

- $\log_b(x)$.

3.2 A

- $\log_5$ of both sides.

3.3

(a)

- $32 = 2^5$

(b)

- $x = 5$

(c)

- 5