

2.10 Inverses of Exponential Functions

Name: _____ Class: _____ Date: _____

Total: 9 marks

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 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]

- **A** b^{-x}
 - **B** $\log_b(x)$
 - **C** $1/b^x$
 - **D** x^b
-

3.2 To solve $5^x = 125$, take [1]

- **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]

4 Go further

- work through the **2.10 Inverses of Exponential Functions** lesson on the **Learn** page;
- read the **Exponential and Logarithmic Functions** section of the AP Precalculus handout on the **Know** page.

Solutions

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.

3.2 A.

3.3 (a) $32 = 2^5$. (b) $x = 5$. (c) 5.