

2.15 Semi-log Plots

Name: _____ Class: _____ Date: _____

Total: 9 marks

Objective

Build the skills to answer exam questions on **semi-log plots**.

You must be able to:

- explain how a **semi-log plot** 半对数图 linearizes exponential data
- relate the slope and intercept to the model $y = a \cdot b^x$

1 Worked examples

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

■ Semi-log plots

A semi-log plot graphs $\log(y)$ against x . For exponential data $y = a \cdot b^x$,

$$\log(y) = \log a + x \log b,$$

which is **linear** in x . So exponential data appear as a **straight line** on a semi-log plot; the slope is $\log b$ and the intercept is $\log a$.

■ From the line back to the model

Suppose a semi-log plot of some data is a straight line with slope 0.3 and intercept 1. Then $\log b = 0.3$ and $\log a = 1$, so $b = 10^{0.3} \approx 2$ and $a = 10^1 = 10$. The exponential model is $y \approx 10 \cdot 2^x$.

2 Practice

2.1 State what a semi-log plot graphs.

[1]

2.2 State what a straight line on a semi-log plot indicates.

[1]

2.3 For $y = a \cdot b^x$, what does $\log(y)$ equal? [2]

3 Exam-style questions

3.1 A semi-log plot graphs [1]

- **A** y vs x
 - **B** $\log(y)$ vs x
 - **C** $\log(y)$ vs $\log(x)$
 - **D** x vs y
-

3.2 A straight line on a semi-log plot indicates the data are [1]

- **A** linear
 - **B** exponential
 - **C** quadratic
 - **D** constant
-

3.3 $y = a \cdot b^x$.

(a) Take log of both sides. [1]

(b) State the slope of $\log(y)$ vs x . [1]

(c) State the vertical intercept. [1]

4 Go further

- work through the **2.15 Semi-log Plots** lesson on the **Learn** page;
- read the **Exponential and Logarithmic Functions** section of the AP Precalculus handout on the **Know** page.

Solutions

2.1 $\log(y)$ against x .

2.2 the data are exponential.

2.3 $\log(y) = \log a + x \log b$.

3.1 B.

3.2 B.

3.3 (a) $\log(y) = \log a + x \log b$. (b) $\log b$. (c) $\log a$.