

1.14 Function Model Construction and Application

Name: _____ Class: _____ Date: _____ **Total: 8 marks**

KEY WORDS function model 函数模型 • model 模型 • function 函数 • zero 零点
• leading coefficient 首项系数

Objective

Build the skills to answer exam questions on **function model construction and application**.

You must be able to:

- construct a **function model** 函数模型 from zeros, points, and transformations
- apply the model to make a prediction

1 Worked examples

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

■ Constructing a model

Use the given conditions: **zeros** give factors, one extra **point** fixes the leading coefficient, and stated **transformations** set the shifts.

■ Example

A parabola with zeros at $x = 1$ and $x = 5$ passing through $(3, -4)$: write $f(x) = a(x - 1)(x - 5)$. At $x = 3$: $a(2)(-2) = -4a = -4$, so $a = 1$ and $f(x) = (x - 1)(x - 5)$.

2 Practice

2.1 Write the factored form of a quadratic with zeros at 2 and 6. [1]

2.2 State what extra information fixes the leading coefficient. [1]

2.3 Evaluate $f(x) = (x - 1)(x - 5)$ at $x = 0$. [1]

3 Exam-style questions

3.1 A quadratic model with zeros at $x = r$ and $x = s$ has the form [1]

- **A** $a(x - r)(x - s)$
- **B** $ax + b$
- **C** a/x
- **D** a^x

3.2 To find the leading coefficient a , you need [1]

- **A** the degree
- **B** one additional point on the graph
- **C** the axis of symmetry
- **D** nothing extra

3.3 A parabola has zeros at $x = 1$ and $x = 5$ and passes through $(3, -4)$.

(a) Write it as $f(x) = a(x - 1)(x - 5)$ and substitute $(3, -4)$. [1]

(b) Solve for a . [1]

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

Solutions

2.1 $a(x - 2)(x - 6)$.

2.2 one additional point that the graph passes through.

2.3 $(0 - 1)(0 - 5) = (-1)(-5) = 5$.

3.1 A.

3.2 B.

3.3 (a) $a(3 - 1)(3 - 5) = -4$, i.e. $-4a = -4$. (b) $a = 1$. (c) $f(x) = (x - 1)(x - 5)$.