AP PRECALCULUS • EXERCISE SHEET

2.6 Competing Function Model Validation

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

KEY WORDS residual 残差 • residual plot 残差图

Objective

Build the skills to answer exam questions on **competing function model validation**.

You must be able to:

- compute a **residual** 残差 (observed minus predicted)
- use residuals to compare and validate competing models

1 Worked examples

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

■ **Residuals**

$$\text{residual} = \text{observed} - \text{predicted}.$$

A model fits well when the residuals are **small** and show **no pattern**. To choose between two candidate models, compare their residuals.

■ **Example**

Observed 20, predicted 18 → residual = 2 (the model under-predicted).

2 Practice

2.1 Define a residual. [1]

2.2 State what small, patternless residuals indicate. [1]

2.3 The observed value is 20 and the predicted value is 18. Find the residual. [1]

3 Exam-style questions

3.1 A residual is [1]

- **A** predicted minus observed
- **B** observed minus predicted
- **C** observed times predicted
- **D** the slope

3.2 A well-fitting model has residuals that are [1]

- **A** large and patterned
- **B** small and patternless
- **C** all positive
- **D** steadily increasing

3.3 A model predicts 50; the actual value is 46.

(a) Find the residual. [1]

(b) State whether the model over- or under-predicted. [1]

(c) State what a residual plot should look like for a good fit. [1]

Solutions

2.1 the observed value minus the predicted value.

2.2 the model fits the data well.

2.3 $20 - 18 = 2$.

3.1 **B**.

3.2 **B**.

3.3 (a) $46 - 50 = -4$. (b) over-predicted. (c) scattered around zero with no pattern.