

# 1.11 Equivalent Representations of Polynomial and Rational Expressions

Name: \_\_\_\_\_ Class: \_\_\_\_\_ Date: \_\_\_\_\_ Total: 9 marks

**KEY WORDS** factored form 因式分解形式 • standard form 标准形式 • end behavior 末端行为  
• hole 空洞 • zero 零点

## Objective

Build the skills to answer exam questions on **equivalent representations of polynomial and rational expressions**.

You must be able to:

- use the **factored form** 因式分解形式 to read off zeros, intercepts, asymptotes, and holes
- use the **standard form** 标准形式 to read off end behavior

## 1 Worked examples

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

### ■ Two useful forms

- **Factored form** shows the **real zeros** directly, revealing  $x$ -intercepts, vertical asymptotes, holes, and domain.
- **Standard form** (expanded) shows the **leading term**, revealing **end behavior**.

### ■ Example

$p(x) = (x - 1)(x + 3)$  has  $x$ -intercepts at 1 and  $-3$ ; expanded,  $p(x) = x^2 + 2x - 3$  shows an upward parabola (even degree, positive leading coefficient).

## 2 Practice

2.1 State what the factored form of a function reveals. [1]

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2.2 State what the standard (expanded) form reveals. [1]

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2.3 For  $p(x) = (x - 1)(x + 3)$ , state the  $x$ -intercepts. [2]

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## 3 Exam-style questions

3.1 The factored form of a polynomial readily shows its [1]

- **A** end behavior
- **B** real zeros /  $x$ -intercepts
- **C** leading coefficient only
- **D** nothing useful

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3.2 The standard form best reveals a function's [1]

- **A** holes
- **B** end behavior
- **C**  $x$ -intercepts
- **D** domain

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3.3  $p(x) = (x - 2)(x + 5)$ .

(a) State the  $x$ -intercepts. [1]

(b) Expand to standard form. [2]

## Solutions

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**2.1** the real zeros, and hence  $x$ -intercepts, asymptotes, holes, and domain.

**2.2** the end behavior (via the leading term).

**2.3**  $x = 1$  and  $x = -3$ .

**3.1 B.**

**3.2 B.**

**3.3** (a)  $x = 2$  and  $x = -5$ . (b)  $x^2 + 3x - 10$ .