3

Polynomial Functions

General Outcome

Develop algebraic and graphical reasoning through the study of relations.

Specific Outcomes

RF11 Demonstrate an understanding of factoring polynomials of degree greater than 2 (limited to polynomials of degree ≤ 5 with integral coefficients).

RF12 Graph and analyze polynomial functions (limited to polynomial functions of degree ≤ 5).

By the end of this chapter, students will be able to:

Section	Understanding Concepts, Skills, and Processes
3.1	✓ identify polynomial functions
	✓ analyse polynomial functions
3.2	✓ describe the relationship between polynomial long division and synthetic division
	✓ divide polynomials by binomials of the form $x - a$ using long division or synthetic division
	✓ explain the relationship between the remainder when a polynomial is divided by a binomial of the form $x - a$ and the value of the polynomial at $x = a$
3.3	✓ factor polynomials
	✓ explain the relationship between the linear factors of a polynomial expression and the zeros of the corresponding function
	✓ model and solve problems involving polynomial functions
3.4	✓ describe the relationship between zeros, roots, and x-intercepts of polynomial functions and equations
	✓ sketch the graph of a polynomial function without technology
	✓ model and solve problems involving polynomial functions
	✓ apply translations and stretches to the graphs and equations of polynomial functions

Assessment	Supporting Learning
Assessment *for* Learning	
Method 1: Use the introduction on page 104 in *Pre-Calculus 12* to activate students' prior knowledge about the skills and processes that will be covered in this chapter. **Method 2:** Have students develop a journal entry to explain what they personally know about polynomials and polynomial functions.	• Have students update their list of what they need to work on and keep track of the skills and processes that need attention. • Students who require activation of prerequisite skills may wish to complete **BLM 3–1 Chapter 3 Prerequisite Skills**. This material is on the Teacher CD of this Teacher's Resource and mounted on the www.mcgrawhill.ca/school/learningcentres book site.
Assessment *as* Learning	
As students work on each section in Chapter 3, have them keep track of any problems they are having.	• As students complete each section, have them review the list of items they need to work on and check off any that have been handled. • Encourage students to write definitions for the Key Terms in their own words, including reminder tips that may be helpful for review throughout the chapter. • Encourage students to write examples of their own in their notebook or math portfolio. Students should have an example for each method that is covered in the chapter.
Assessment *for* Learning	
BLM 3–1 Chapter 3 Prerequisite Skills This master provides a review of prerequisite skills needed for the chapter.	• Use the Prerequisite Skills blackline master to provide additional opportunities for students to demonstrate their readiness for the chapter material.

Chapter 3 Planning Chart

Section/ Suggested Timing	Prerequisite Skills	Materials/Technology	Teacher's Resource Blackline Masters	Exercise Guide	Assessment			Web Link
					Assessment *as* Learning	Assessment *for* Learning	Assessment *of* Learning	www.mcgrawhill.ca/school/learningcentres
Chapter Opener • 45–60 min (TR page 61)			BLM 3–1 Chapter 3 Prerequisite Skills BLM U1–1 Unit 1 Project Checklist					• careers and educational programs
3.1 Characteristics of Polynomial Functions • 90–120 min (TR page 62)	Students should be familiar with • multiplying and combining like terms • determining the greatest common factor • factoring polynomials • factoring perfect square trinomials • absolute value • entering expressions, setting windows, and graphing using technology	• graphing technology	BLM 3–2 Section 3.1 Investigate Graphs of Polynomial Functions BLM 3–3 Section 3.1 Extra Practice	**Essential:** #1–4, 6, 7 **Typical:** #1–5, 7–9, 10, C1–C4 **Extension/Enrichment:** #9–13, C1–C4	TR pages 65, 66	TR page 66		• information on French beekeepers in western Canada
3.2 The Remainder Theorem • 90–120 min (TR page 67)	Students should be familiar with • long division process • divisor, dividend, quotient, and remainder • restrictions on variables		BLM 3–4 Section 3.2 Extra Practice	**Essential:** #1, 2, 3a), b), 4a)–c), 5a)–c), 6, 8a), b), 9, 11 **Typical:** #2, 3c), d), 4d)–f), 5d)–f), 6, 7a), b), 8c), d), 10, 12, C1–C3 **Extension/Enrichment:** #7, 10, 13–17, C1–C3	TR pages 68, 70	TR pages 69, 70		
3.3 The Factor Theorem • 60–90 min (TR page 71)	Students should be familiar with • factoring polynomials • zeros of a function and roots of an equation	• graphing technology	BLM 3–5 Section 3.3 Extra Practice	**Essential:** #1, 2a), b), e), 3a), b), e), 4, 5, 6a), b), 7–9, 11 **Typical:** #1, 2c), d), f), 3c), d), f), 4, 5, 6c)–e), 7, 9, 10, 13, C1–C3 **Extension/Enrichment:** 12–16, C1–C3	TR pages 72, 74	TR pages 73, 74		
3.4 Equations and Graphs of Polynomial Functions • 90–120 min (TR page 75)	Students should be familiar with • zero principle • sketching graphs of functions with or without technology • transformations of the graphs of functions and their related equations, including horizontal and vertical translations, horizontal and vertical stretches, and reflections • effects of the parameters a, b, h, and k • order in which transformations are applied	• graphing technology	BLM 3–6 Section 3.4 Extra Practice	**Essential:** #1–5, 7, 8, 10–12 **Typical:** #3, 4, 6–10, two of 13, 15–18, C1, C2 **Extension/Enrichment:** #6, 19–23, C1–C4	TR pages 76, 79	TR pages 78, 79		• information on French festivals that have ice sculptures as an activity
Chapter 3 Review and Practice Test • 90–135 min (TR page 80)		• graphing technology	BLM 3–3 Section 3.1 Extra Practice BLM 3–4 Section 3.2 Extra Practice BLM 3–5 Section 3.3 Extra Practice BLM 3–6 Section 3.4 Extra Practice BLM 3–7 Chapter 3 Study Guide BLM 3–8 Chapter 3 Test	Have students do at least one question related to any concept, skill, or process that has been giving them trouble. **Chapter 3 Review minimum:** #1–8, 10, 12–14 Provide students with the number of questions they can comfortably do in one class. Choose at least one question for each concept, skill, or process. **Chapter 3 Practice Test minimum:** #1–5, 6a), b), 7b), c), 8, 10		TR page 80	TR page 80 BLM 3–8 Chapter 3 Test	
Unit 1 Project Wrap-Up • 60 min (TR page 81)			Master 1 Holistic Project Rubric Master 2 Ana-Holistic Project Rubric BLM U1–1 Unit 1 Project Checklist				TR page 82 Master 1 Holistic Project Rubric Master 2 Ana-Holistic Project Rubric	• sample Unit 1 Project Holistic Rubric • sample Unit 1 Project Ana-Holistic Rubric
Unit 1 Cumulative Review and Test • 90–135 min (TR page 83)		• grid paper • graphing technology	Master 3 Centimetre Grid Paper BLM U1–2 Unit 1 Test BLM 3–9 Chapter 3 BLM Answers	Have students do at least one question related to any concept, skill, or process that has been giving them trouble.		TR page 83	TR page 83	