Quadratic Equations

4

General Outcome

Develop algebraic and graphical reasoning through the study of relations.

Specific Outcomes

RF1 Factor polynomial expressions of the form:
- $ax^2 + bx + c, a \neq 0$
- $a^2x^2 - b^2y^2, a \neq 0, b \neq 0$
- $a(f(x))^2 + b(f(x)) + c, a \neq 0$
- $a^2(f(x))^2 - b^2(g(y))^2, a \neq 0, b \neq 0$

where a, b and c are rational numbers.

RF4 Analyze quadratic functions of the form $y = ax^2 + bx + c$ to identify characteristics of the corresponding graph, including:
- vertex
- domain and range
- direction of opening
- axis of symmetry
- x- and y-intercepts

and to solve problems.

RF5 Solve problems that involve quadratic equations.

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

Section	Understanding Concepts, Skills, and Processes
4.1	✓ describe the relationships between the roots of a quadratic equation, the zeros of the corresponding quadratic function, and the x-intercepts of the graph of the quadratic function
	✓ solve quadratic equations by graphing the corresponding quadratic function
4.2	✓ factor a variety of quadratic expressions
	✓ use factoring to solve quadratic equations
	✓ solve problems involving quadratic equations
4.3	✓ solve quadratic equations using the process of completing the square
4.4	✓ develop the quadratic formula
	✓ solve quadratic equations using the quadratic formula
	✓ use the discriminant to determine the nature of the roots of a quadratic equation
	✓ select an appropriate method for solving a quadratic equation
	✓ solve problems involving quadratic equations

Assessment	Supporting Learning
Assessment *as* Learning	
Use the Before column of **BLM 4–1 Chapter 4 Self-Assessment** to provide students with the big picture for this chapter and help them identify what they already know, understand, and can do. You may wish to have students keep this master in their math portfolio and refer to it during the chapter.	• During work on the chapter, have students keep track of what they need to work on. They can check off each item as they develop the skill or process at an appropriate level.
Assessment *for* Learning	
Method 1: Use the introduction on pages 204–205 in *Pre-Calculus 11* 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 quadric equations, factoring, completing the square, and the quadratic formula.	• Have students use their list of what they need to work on to keep track of the skills and processes that need attention. They can check off each item as they develop the skill or process at an appropriate level. • Students who require activation of prerequisite skills may wish to complete **BLM 4–2 Chapter 4 Prerequisite Skills**. This material is on the Teacher CD of this Teacher's Resource and mounted on the www.mhrprecalc11.ca book site.
Assessment *as* Learning	
As students work on each section in Chapter 4, have them keep track of any problems they are having.	• As students complete each section, have them revisit 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 4–3 Chapter 4 Warm-Up This reproducible master includes a warm-up to be used at the beginning of each section. Each warm-up provides a review of prerequisite skills needed for the section.	• As students complete questions, note which skills they are retaining and which ones may need additional reinforcement. • Use the warm-up to provide additional opportunities for students to demonstrate their readiness for the chapter material. • Have students share their strategies for completing mathematics calculations.

Chapter 4 Planning Chart

Section/ Suggested Timing	Prerequisite Skills	Materials/Technology	Teacher's Resource Blackline Masters	Exercise Guide	Assessment as Learning	Assessment for Learning	Assessment of Learning
Chapter Opener • 30–45 min (TR page 141)	Students should be familiar with • quadratic equations		BLM 4–1 Chapter 4 Self-Assessment BLM 4–2 Chapter 4 Prerequisite Skills BLM U2–1 Unit 2 Project Checklist				
4.1 Graphical Solutions of Quadratic Equations • 90–135 min (TR page 143)	Students should be familiar with • elements of a graph, including vertices (maximum and minimums), range and domain, and lines of symmetry • converting between different forms of equations • models and functions • x-intercepts and y-intercepts	• grid paper • graphing calculator • spreadsheet program • ruler	Master 2 Centimetre Grid Paper BLM 4–3 Chapter 4 Warm-Up BLM 4–4 Section 4.1 Extra Practice TM 4–1 How to Do Page 208 Example 1 Using Microsoft® *Excel* TM 4–2 How to Do Page 208 Example 1 Using TI-Nspire™	**Essential:** #1–5, 9, 17, 18 **Typical:** #1–3, 5, 6, two of 8–10, 12, 17–19 **Extension/Enrichment:** #4, 6, 12, 13, 16	TR pages 145, 148	TR pages 146–148	
4.2 Factoring Quadratic Equations • 135–180 min (TR page 149)	Students should be familiar with • factoring • multiplying binomials • solving equations by substitution • Pythagorean Theorem	• grid paper • graphing calculator or computer with graphing software • algebra tiles • blank laminated cards • ruler	Master 2 Centimetre Grid Paper BLM 4–3 Chapter 4 Warm-Up BLM 4–5 Section 4.2 Extra Practice	**Essential:** #1, 2a), c), 3a), 4a)–c), 5a), b), 7a), c), d), 9a), b), d), 11, 30, 32 **Typical:** #1, 2a), c), 3a), b), 4a)–c), 5, 6a), b), 7a), b), d), 9b), c), f), 10c), 13, 16, 20, 29, 31, 32 **Extension/Enrichment:** #5, 6, 7c), e), f), 8c)–e), 9b), c), f), 10e), 17, 23, 29–32	TR pages 150, 154	TR pages 152, 154	
4.3 Solving Quadratic Equations by Completing the Square • 90–135 min (TR page155)	Students should be familiar with • factoring • completing the square • square roots	• grid paper • graphing calculator or computer with graphing software • ruler	Master 2 Centimetre Grid Paper BLM 4–3 Chapter 4 Warm-Up BLM 4–6 Section 4.3 Extra Practice	**Essential:** #1, 3d), 5a), c), f), 6a), c), d), 7a), c), e), 8, 9, 20 **Typical:** #1c), e), 5a), c), f), 6a), c), d), 7a)–d), 10–12, 20 **Extension/Enrichment:** #3e), f), 5b), d), e), 6e), f), 7f), g), 11, 13–15, 20, 21	TR pages 156, 159	TR pages 157, 159	
4.4 The Quadratic Formula • 90–135 min (TR page 160)	Students should be familiar with • rewriting quadratic equations in different forms • square roots	• graphing calculator	BLM 4–3 Chapter 4 Warm-Up BLM 4–7 Section 4.4 Extra Practice	**Essential:** #1, 3a), c), e), 4a), b), 6, 7a), d), 11, 21–24 **Typical:** #2, 3a), c), e), 4a), b), 5b), c), d), 6, 7a), b), d), 8, 9, 13, 15, 21–24 **Extension/Enrichment:** #2, 3d), f), 4e), f), 5b), c), e), 6, 11, 13, 17–19, 21–24	TR pages 161, 165	TR pages 163, 165	
Chapter 4 Review • 90–135 min (TR page 166)		• grid paper • graphing calculator or computer with graphing software	Master 2 Centimetre Grid Paper BLM 4–4 Section 4.1 Extra Practice BLM 4–5 Section 4.2 Extra Practice BLM 4–6 Section 4.3 Extra Practice BLM 4–7 Section 4.4 Extra Practice BLM 4–8 Chapter 4 Review #22	Have students do at least one question related to any concept, skill, or process that has been giving them trouble.		TR page 166	
Chapter 4 Practice Test • 45–60 min (TR page 167)		• grid paper	Master 2 Centimetre Grid Paper BLM 4–9 Chapter 4 Practice Test	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. **Minimum:** #1–4, 7, 8, 11	TR page 167		TR page 167 BLM 4–9 Chapter 4 Test
Unit 2 Project Wrap-Up • 60–90 min (TR page 168)			Master 1 Project Rubric BLM U2–1 Unit 2 Project Checklist BLM U2–2 Unit 2 Project Rubric – Option 1 BLM U2–3 Unit 2 Project Rubric – Option 2				TR page 169 Master 1 Project Rubric
Unit 2 Cumulative Review and Test • 60–90 min (TR page 170)		• grid paper	BLM U2–4 Unit 2 Test BLM 4–10 Chapter 4 BLM Answers	Have students do at least one question related to any concept, skill, or process that has been giving them trouble.		TR page 170	TR page 170