

Open tools for writing open interactive textbooks (and more)

Matthew Crump

2018: Last compiled 2019-06-22

Contents

Preface	6
1 Quadratic Functions and Factoring	9
1.1 Review of Functions	10
1.2 Qudaratic Functions in Vertex Form	10
1.3 Quadratic Functions in Standard Form	10
1.4 Quadratic Functions in Intecept Form	10
1.5 Other Methods	10
1.6 Quadratic Modeling	10
1.7 Review Exercises	10
2 Polynomials and Polynomial Functions	11
2.1 Review: Properties of Exponents	12
2.2 Basics Polynomial Functions	12
2.3 Graphs of Polynomial Functions	12
2.4 Factor and Solve Polynomial Equations	12
2.5 Analyze Grapsh of Polynomial Functions	12
3 Rational Expressions, Equations, and Functions	13
3.1 Reciprocal Function $f(x) = \frac{1}{x}$	13
3.2 Rational Expressions	13
3.3 Graph Rational Functions	13
3.4 Solve Rational Equations	13
3.5 Writing Rational Equations from Graphs	13
3.6 Partial Fraction Decomposition	13
4 Rational Exponents and Radical Functions	15
4.1 Evaluate nth Roots and Use Rational Exponents	15
4.2 Apply Properties of Rational Exponents	15
4.3 Function Operations and Inverses Revisited	15
4.4 Graph Square Root and Cube Root Functions	15
4.5 Solve Radical Equations	15
5 Exponential and Logarithmic Functions	17

5.1	Exponential Functions	18
5.2	Logarithmic Functions	18
5.3	Solve Exponential and Logarithmic Equations	18
5.4	Write and Apply Exponential and Power Functions	18
6	Trigonometry	19
6.1	Angle Measurement	19
6.2	Right Triangle Trigonometry	19
6.3	Trigonometry of Any Angle	19
6.4	Unit Circle Trigonometry	19
6.5	Evaluate Inverse Trigonometric Functions	19
6.6	Law of Sines	19
6.7	Law of Cosines	19
6.8	Trigonometric Graphs	19
6.9	Write Trigonometric Models	19
6.10	Trigonometric Identities	19
6.11	Solve Trigonometric Equations	19
7	Data Analysis and Statistics	21
7.1	Combinations and the Binomial Theorem	21
7.2	Binomial Distributions	21
7.3	Normal Distributions	21
8	Sequences and Series	23
8.1	Define and Use Sequences and Series	23
8.2	Arithmetic Sequences and Series	23
8.3	Geometric Sequences and Series	23
8.4	Sums of Infinite Geometric Series	23
8.5	Recursive Rules	23
9	Quadratic Relations and Conic Sections	25
9.1	Apply Distance and Midpoint Formulas	25
9.2	Parabolas	25
9.3	Circles	25
9.4	Ellipses	25
9.5	Hyperbolas	25
9.6	Translate and Classify Conic Sections	25
9.7	Solve Quadratic Systems	25

Preface

Open tools for writing open interactive textbooks

A tutorial resource: R, RStudio, RMarkdown,
Bookdown, Github, Shiny, hypothes.is, Zotero



Matthew J. C. Crump (2018)

Crump, Matthew J. C. (2018). Open tools for writing open interactive textbooks (and more). <https://crumplab.github.io/programmingforpsych/>

This is a tutorial and set of working examples for creating web-based textbooks using a collection of open-source tools.

This web-book is itself a working example. All of the source code needed to compile this book yourself is included in the github repository for this book. So, you could download the repository, and by following the instructions laid out across the chapters, replace this text with your own, and then compile your book as a web-page, .pdf or epub.

Feel free to contribute to this tutorial by submitting pull requests to this repository.

License CC BY-SA 4.0 license

The book is released under a creative commons CC BY-SA 4.0 license. This means that this book can be reused, remixed, retained, revised and redistributed (including commercially) as long as appropriate credit is given to the authors. If you remix, or modify the original version of this open textbook, you must redistribute all versions of this open textbook under the same license - CC BY-SA 4.0.

Chapter 1

Quadratic Functions and Factoring

1.1 Review of Functions

1.1.1 What is a Function

1.1.2 Parent Functions

1.1.2.1 Constant

1.1.2.2 Linear

1.1.2.3 Absolute Value

1.1.3 Function Operations

1.1.3.1 Arithmetic Operations

1.1.3.2 Composition

1.1.4 Inverse Functions

1.1.4.1 Finding Inverse Functions

1.2 Quadratic Functions in Vertex Form

1.2.1 Graphing

1.2.2 Solving

1.3 Quadratic Functions in Standard Form

1.3.1 Graphing

1.3.2 Factoring

1.3.2.1 Factoring $x^2 + bx + c$

1.3.2.2 Factoring $ax^2 + bx + c$

1.3.3 Solving

1.4 Quadratic Functions in Intercept Form

Chapter 2

Polynomials and Polynomial Functions

2.1 Review: Properties of Exponents

2.2 Basics Polynomial Functions

2.2.1 Fundamentals

2.2.2 Polynomial Operations

2.2.3 End Behavior

2.2.4 Zeros

2.3 Graphs of Polynomial Functions

2.3.1 Intercept Form

2.3.2 Equations of Polynomial Functions from Graph

2.4 Factor and Solve Polynomial Equations

2.4.1 Special Patterns

2.4.2 Factoring Tools

2.4.2.1 Remainder and Factor Theorem

2.4.2.2 Synthetic Division and Substitution

2.4.2.3 Rational Root Theorem

2.4.2.4 Descartes Rule of Signs

2.4.2.5 Fundamental Theorem of Algebra

2.4.3 Find Rational Zeros

2.4.4 Find Real Zeros

2.5 Analyze Graph of Polynomial Functions

2.5.1 Writing Least Degree Polynomial Function from

Chapter 3

Rational Expressions, Equations, and Functions

3.1 Reciprocal Function $f(x) = \frac{1}{x}$

3.1.1 Graph of Reciprocal Function

3.1.2 Transformation of Graphs

3.1.3 Change $f(x) = \frac{x+a}{x+b}$ to $f(x) = \frac{a}{x-h} + k$

3.1.4 Model Inverse and Joint Variation

3.2 Rational Expressions

3.2.1 Multiply and Divide Rational Expressions

3.2.2 Add and Subtract Rational Expressions

3.3 Graph Rational Functions

3.3.1 Rules for Graphing Rational Functions

3.4 Solve Rational Equations

3.5 Writing Rational Equations from Graphs

3.6 Partial Fraction Decomposition

Chapter 4

Rational Exponents and Radical Functions

- 4.1 Evaluate n th Roots and Use Rational Exponents
- 4.2 Apply Properties of Rational Exponents
- 4.3 Function Operations and Inverses Revisited
- 4.4 Graph Square Root and Cube Root Functions
- 4.5 Solve Radical Equations

Chapter 5

Exponential and Logarithmic Functions

5.1 Exponential Functions

5.1.1 Standard Form

5.1.1.1 Growth

5.1.1.2 Decay

5.1.2 Graphs

5.1.2.1 Growth

5.1.2.2 Decay

5.1.3 The Exponential Function

5.2 Logarithmic Functions

5.2.1 Definition of a Logarithm

5.2.2 Properties of Logarithms

5.2.3 Graphs of Logarithmic Functions

5.3 Solve Exponential and Logarithmic Equations

5.4 Write and Apply Exponential and Power Functions

Chapter 6

Trigonometry

6.1 Angle Measurement

6.2 Right Triangle Trigonometry

6.3 Trigonometry of Any Angle

6.4 Unit Circle Trigonometry

6.5 Evaluate Inverse Trigonometric Functions

6.6 Law of Sines

6.7 Law of Cosines

6.8 Trigonometric Graphs

6.9 Write Trigonometric Models

6.10 Trigonometric Identities

6.11 Solve Trigonometric Equations

Chapter 7

Data Analysis and Statistics

7.1 Combinations and the Binomial Theorem

7.2 Binomial Distributions

7.3 Normal Distributions

Chapter 8

Sequences and Series

8.1 Define and Use Sequences and Series

8.2 Arithmetic Sequences and Series

8.3 Geometric Sequences and Series

8.4 Sums of Infinite Geometric Series

8.5 Recursive Rules

Chapter 9

Quadratic Relations and Conic Sections

9.1 Apply Distance and Midpoint Formulas

9.2 Parabolas

9.3 Circles

9.4 Ellipses

9.5 Hyperbolas

9.6 Translate and Classify Conic Sections

9.7 Solve Quadratic Systems