The Mathematics Survival Kit - Maple Edition

Version 3

Table of Contents

Introduction
Introduction to the Maple Edition
What's New in This Version?

Getting Started on Survival

How to Use This Book - Read This!
How to Get an "A" in Math
How to Get Extra Help

Operation Cooperation and Fraction Traction

BEDMAS (Order of Operations)
Adding and Subtracting Fractions
Multiplying and Dividing Fractions
Operations with Decimals
Ratio, Rate and Percent
Complex Numbers

Factoring: A Product of Practice

Difference of Squares
Difference of Cubes
Factoring $a^n - b^n$ and $a^n + b^n$
Common Factors
Factoring Easy Trinomials
The Remainder and Factor Theorems for Polynomials

Pliable Polynomials

Multiplying Polynomials - FOIL
Adding and Subtracting Polynomial Fractions
Multiplying and Dividing Polynomial Fractions
Polynomial Division

A Partial Look into Partial Fractions

Partial Fractions: Preliminaries
Partial Fractions: Distinct Linear Factors
Partial Fractions: Repeated Linear Factors
Partial Fractions: Irreducible Quadratics

The Straight Goods on Lines and Planes

Finding the Equation of a Line
Slope *m* and *y* intercept *b*
Graphing a Straight Line Using $y = m \cdot x + b$
Distance between Two Points and Distance from a Point to a Line or Plane
Visually Identifying Slopes of Lines
Parallel and Perpendicular Lines
Finding Tangent and Normal Lines to a Curve

A Few Lines on Linear Algebra

Solving a Linear Equation
Solving Two Linear Equations Using Substitution
Solving Two Linear Equations Using Row Reduction
Solving Three Linear Equations Using Row Reduction
Consistent, Inconsistent and Dependent Systems of Linear Equations

Giving the Third Degree to Second Degree Polynomials: Quadratics!

Solving Quadratic Equations Using the Quadratic Formula
Factoring Quadratic Equations Using the Quadratic Formula
Problems Involving the Sum and Product of the Roots of a Quadratic Equation
The Graph of $y = a(x-b)^2 + c$
Completing the Square

Solving Inequalities with Less (<) Difficulty, Greater (>) Ease

Solving Linear Inequalities
Solving Quadratic Inequalities

Solving Inequalities with Two or More Factors
Solving Rational Inequalities

Increasing the Magnitude of Your Absolute Value Knowledge

The Basics of Absolute Value
Solving Absolute Value Equations
Solving Easy Absolute Value Inequalities
Solving Less Easy Absolute Value Inequalities

Getting to the Root of Square Roots

The Basics of Square Root and the Reason $\sqrt{x^2} = |x|$
Solving Equations Involving Square Roots
Rationalizing Denominators that Have $\sqrt{\ }$

Some Basic Graphs and Some Basics about Graphs

Graphs of Basic Quadratic Relations
Basic $y = x^n$ Graphs, where $n \in N$ (Even and Odd Functions)
Basic $y = x^{-n}$ Graphs, where $n \in N$
Basic $y = x^{\frac{1}{n}}$ Graphs, where $n \in N$
Shifting or Rescaling a Given Graph
Tests for Symmetry
Graphing Polynomials without Calculus
Vertical and Horizontal Asymptotes
Slant Asymptotes
Intersection of Two Curves
The Greatest Integer (or Floor) Function
Graphs with the Greatest Integer Function

The Survival Kit Logs Powerful Time with Exponents and Logarithms

Properties of Exponents
Logarithms (Log Means "FIND THE EXPONENT!")
Basic Exponential Graphs
Basic Logarithmic Graphs
Inverse Formulas for Exponents and Logarithms
Solving Exponential Equations
Solving Logarithmic Equations
The Derivative of e^x and a^x

The Derivative of $\ln(x)$ and $\log_a(x)$

Log Differentiation Part I

Log Differentiation Part II: The derivative of $y = f(x)^{g(x)}$

Integrals Yielding ln: $\int \frac{\frac{du}{dx}}{u} \, dx = \ln(|u|) + C$

Drawing Your Attention to Some Basic Geometry

A Degree of Knowledge About Angles

The Pythagorean Theorem

Similar Triangles

Radian Measure of an Angle

Angling Right in on Trigonometry

Basic Trigonometric Ratios: SOH CAH TOA

Using SOH CAH TOA to Find Missing Sides and Angles

Angles in Standard Position

Related Angles in Standard Position

Trig Ratios for the $(30^o, 60^o, 90^o)$ Triangle

Trig Ratios for the $(45^o, 45^o, 90^o)$ Triangle

Trig Ratios for $30^o, 45^o, 60^o, 90^o, 120^o$, and More - A Table!

Trig Ratios for $30^o, 45^o, 60^o, 90^o, 120^o$, and More - A (Fabulous) Picture!!

Basic Trigonometric Graphs

The Circle Definition of Sine and Cosine

Solving the Trig Equation $\sin(x) = c$

Solving the Trig Equation $\cos(x) = c$

The Sine Law

The Cosine Law

Commonly Used Trigonometric Formulas Including Derivatives and Integrals

Basic Inverse Trigonometric Graphs

A Straightforward Approach to Limits

Easy Limits: "No Problem" Problems

"0/0" Limits

One-sided Limits

Limits which Approach ∞

Limits at Infinity

An "$\infty - \infty$" Limit: $\lim_{x \to \infty} \left(\sqrt{x^2 - 8 \cdot x} - x \right)$

Variations on $\lim_{\theta \to 0} \left(\frac{\sin(\theta)}{\theta} \right) = 1$

L'Hôpital's Rule
L'Hôpital's Rule Disguised: Converting IFs to Fractions

Continuity (There's a Hole in the Function, Dear Liza, Dear Liza)

Domain (Food for a Function!)
Composite Functions
Continuity and Discontinuity at a Point
Continuous Functions (Intervals of Continuity)
Continuity and Branch Functions
Essential versus Removable Discontinuities

Derivatives or Going on a Tangent about Slopes

Finding the Derivative from the Definition
Differentiable Functions (Intervals of Differentiability)
Differentiability and Branch Functions
Critical Numbers
Min and Max Points from the First Derivative
Graphing and Interpreting y versus y' versus y''
Graph Sketching with Calculus
Graph Sketching with Calculus: Vertical Tangent!
Estimating Using the Differential
Rolle's Theorem
The Mean Value Theorem

Derivative Rules Rule

Derivatives: The Product Rule
Derivatives: The Chain Rule
Derivatives: The Quotient Rule
Derivatives: Implicit Differentiation
Derivatives: Implicit Differentiation Second Derivative

Integrating Your Knowledge about the Anti-Derivative

Easy Integrals/Anti-Derivatives
Easy Integrals that Need a Little Tweaking
The Chain Rule In Reverse (CRIR): No Adjustments Needed!
CRIR: Adjustments Needed BUT Don't Use Substitution!
CRIR: Adjustments Needed and Using Substitution
Substitution when the CRIR Won't Work
CRIR: Products of Trig Functions
Integration by Parts: The Basic Examples

Integration by Parts: Circular Integration By Parts
Integration by Parts: The Tan-Sec Connection
Integration by Trigonometric Substitution: Sin
Integration by Trigonometric Substitution: Tan
Integration by Trigonometric Substitution: Sec
Integration Using Partial Fractions
Definite Integrals - Area Problems
Definite Integrals Using Substitution
Improper Integrals - Functions with a Discontinuity
Improper Integrals - Infinite Limits of Integration
The Derivative of an Integral
Differential Equations - Separation of Variables

Inverse Functions: Now that's a Switch!

Finding the Inverse of a Function
Derivatives of Inverse Functions

Parametric Equations: Making Relations Functional

Parametric Equations
Derivatives from Parametric Equations
Higher Derivatives from Parametric Equations

Warming Up to Polar Coordinates

Polar Coordinates
Polar to Rectangular Coordinates; Rectangular to Polar Equations
Rectangular to Polar Coordinates; Polar to Rectangular Equations

Going to Any Lengths to Give You New Direction with Vectors

(Very) Basic Vectors
The Dot or Scalar or Inner Product of Two Vectors
The Projection of One Vector on Another
The Vector or Cross Product of Two Vectors
The Vector Equation of a Line
The Vector Equation of a Plane
The Scalar Equation of a Plane: $Ax + By + Cz = D$
Intersection of Two Lines in $\mathbb{R}^3$: Parallel/Coincident Case
Intersection of Two Lines in $\mathbb{R}^3$: Non-Parallel/Non-Coincident Case
Intersection of Two Planes
Intersection of Three Planes: Parallel/Coincident Case
Intersection of Three Planes: Non-Parallel/Non-Coincident Case

A Few Terms in Sequences and Series and a Sampling of Statistics

Summation Notation and Common SUM= $\sum$ Formulas

Arithmetic and Geometric Sequences and Series
Combinations and Permutations: Choosing and Arranging
Elementary Probability
Mean, Median, Mode and Standard Deviation
The Binomial Theorem
Proof by Induction

End Game

Feedback Form
About the Author
Index