A video **College Algebra** course & 6 **Enrichment** videos

Recorded at the University of Missouri – Kansas City in 1998. All times are approximate. About **43 hours total.**

Available on **YouTube** at http://www.youtube.com/user/UMKC

YouTube Playlist: Course: College Algebra with Professor Richard Delaware

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Lecture 1 1:19:35

UNIT 0 - BASICS: Remembrance of Things Past

NUMBERS

- Sets of Objects [4 min.]
- Natural Numbers [7 min.]
- Integers [5 min.]
- Rational Numbers [13 min.]
- Irrational Numbers [2 min.]
- Real Numbers [1 min.]
- The Real Line: From Numbers to Points [4 min.]
- Real Numbers are Ordered [19 min.]
- The Real Line: Distance Between Points [8 min.]
- Real Numbers as Decimals [11 min.]

Lecture 2 27:10

THE LANGUAGE OF MATHEMATICS

- Learning to Read Mathematics [7 min.]
- Some Symbols of Algebra [9 min.]
- Nouns, Pronouns, & The Main Verb of Algebra [4 min.]
- Theorems, Corollaries, Lemmas, and All That [7 min.]

Lecture 3 1:32:36

THE POWERS THAT BE: EXPONENTS

- Integer Exponents [12 min.]
- Operations with Integer Exponents [31 min.]
- Square Roots: A Pair Of Equal Factors [13 min.]
- *N*th Roots & Rational Exponents [12 min.]
- Operations with Rational Exponents [21 min.]

Lecture 4 P 1 (Part 1) 1:35:00

POLYNOMIAL EXPRESSIONS

- What is a Polynomial? [18 min.]
- Adding & Subtracting Polynomials [3 min.]
- Multiplying Polynomials [19 min.]
- A Common Error [5 min.]
- Handy Polynomial Products [15 min.]
- Un-Multiplying (Factoring) Polynomials [28 min.]
- Completing A Perfect Square [10 min.]

Lecture 4 P2 (Part 2) 1:26:38

- Dividing Polynomials: Rational Expressions [24 min.]
- The Art of Simplification [14 min.]
- Solving Some Polynomial & Rational Equations [46 min.]

Lecture 5 40:43

MORE NUMBERS

- Beyond Real Numbers: *Complex* Numbers

A LITTLE GEOMETRY

- Some Area Formulas [8 min.]
- The Pythagorean Theorem & A Visual Proof [12 min.]

Lecture 6 54:51

UNIT 1 - GRAPHS

- Rectangular Coordinates: Geometry Meets Algebra [11 min.]
- Distance Between Points [18 min.]
- Midpoint of a Line Segment [7 min.]
- Your Graphing Device [17 min.]

Lecture 7 1:14:15

- Graphs of Equations [25 min.]
- Intercepts: Crossing the Axes [12 min.]
- Symmetry of Graphs [14 min.]
- Lines: Defining "Slope" [34 min.]

Lecture 8 1:35:22

- Lines & Their Equations [24 min.]
- Parallel & Perpendicular Lines [26 min.]
- Circles & Their Equations [28 min.]
- Some Exercises Explained [16 min.]

Lecture 9 1:24:54

UNIT 2 - FUNCTIONS AND THEIR GRAPHS

- Function: The Central Idea of Mathematics [26 min.]
- The Language & Notation of Functions [20 min.]
- More On Domains [19 min.]
- Function Notation Practice [16 min.]

Lecture 10 1:29:39

- Visualizing Functions: Graphs of $(x, f(x))$ Pairs [26 min.]
- Increasing & Decreasing Functions [23 min.]
- Local Maximums & Local Minimums [18 min.]
- Even & Odd Functions [20 min.]

Lecture 11 52:32

- A Library of Important Functions [20 min.]
- Piecewise Defined Functions [19 min.]
- Some Exercises Explained [11 min.]

Lecture 12 1:50:55

- Graphing Techniques: Vertical & Horizontal Shifts [28 min.]
- Graphing Techniques: Compressions & Stretches [27 min.]
- Graphing Techniques: Reflections Across the Axes [17 min.]
- Putting It All Together: Moving The Graphs of Functions Around The Plane [36 min.]

Lecture 13 41:59

- The Algebra of Functions [16 min.]
- A New Operation Unique To Functions: Composition [24 min.]

Lecture 14 56:54

- Mathematical Models of Real World Problems: Constructing Functions

Lecture 15 1:23:06

UNIT 3 - EQUATIONS & INEQUALITIES: EQUATIONS IN 1 VARIABLE

- Solving Equations (Approximately) with a Graphing Device & The Intermediate Value Theorem [44 min.]
- Solving Linear Equations: The "Linear Formula" or, Graphing [23 min.]
- Solving Non-Linear Equations That Lead To Linear Equations [13 min.]

Lecture 16 1:15:07

- Solving Quadratic Equations: Factoring, or, Graphing [11 min.]
- A Complex Reminder & The Principal Square Root of a Negative Number [12 min.]
- Solving Quadratic Equations: The "Quadratic Formula" & The Discriminant or, Graphing [50 min.]

Lecture 17 23:29

- Some Linear & Quadratic Equation Exercises Explained

Lecture 18 1:03:45

- Setting Up Equations: More Mathematical Models

Lecture 19 36:28

- Solving "Radical" Equations [14 min.]
- Solving Equations "Quadratic in Form" [15 min.]
- Solving Factorable Equations [7 min.]

Lecture 20 54:09

INEQUALITIES IN 1 VARIABLE

- Properties of Inequalities [20 min.]
- Solving Inequalities In General [17 min.]
- Solving Linear Inequalities [19 min.]

Lecture 21 50:32

- Solving Quadratic Inequalities [17 min.]
- Solving Higher-Degree Polynomial Inequalities [14 min.]
- Solving Rational Inequalities [27 min.]

Lecture 22 45:18

EQUATIONS & INEQUALITIES IN 1 VARIABLE

- When Absolute Value Appears: Equations [12 min.]
- When Absolute Value Appears: Inequalities [17 min.]
- More Exercises Explained [15 min.]

Lecture 23 1:26:08

UNIT 4 - POLYNOMIAL & RATIONAL FUNCTIONS: POLYNOMIAL FUNCTIONS

- Degree 2: Quadratic Functions [19 min.]
- Graphing Quadratic Functions [39 min.]
- Quadratic Functions As Mathematical Models [25 min.]

Lecture 24 1:05:26

- Degree "*n*": General Polynomial Functions [8 min.]
- Special Case: Power Functions & Their Graphs [18 min.]
- Graphing General Polynomial Functions: Zeros, Multiplicity, Turning Points & End Behavior [40 min.]

Lecture 25 1:30:40

LOCATING THE ZEROS OF A POLYNOMIAL FUNCTION

- How Many Zeros Are There? [12 min.]
- How Many Zeros Are Real? [13 min.]
- How Many Real Zeros Are Positive? Negative? [16 min.]
- Where (On What Interval) Are All Real Zeros? [22 min.]
- How Can You Guess The Location of Real Zeros? [4 min.]
- How Can You Reduce The Number of Real Zeros? [21 min.]

Lecture 26 39:41

- Strategy & Tools: A Practical Checklist [14 min.]
- Some Polynomial Exercises Explained [22 min.]

Lecture 27 1:29:11

RATIONAL FUNCTIONS

- General Rational Functions [14 min.]
- What Is An Asymptote? [17 min.]
- Finding Asymptotes of Rational Functions [35 min.]
- Graphing Rational Functions [19 min.]

Lecture 28 58:16

UNIT 5 - EXPONENTIAL & LOGARITHMIC FUNCTIONS

EXPONENTIAL FUNCTIONS

- One-To-One Functions [14 min.]
- Exponential Functions & Their Graphs [26 min.]
- The Natural Exponential Function [15 min.]

Lecture 29 54:02

LOGARITHMIC FUNCTIONS

- Inverse Functions [23 min.]
- Logarithmic Functions & Their Graphs [24 min.]
- The Natural Logarithmic Function [4 min.]

Lecture 30 1:11:20

- Properties of Logarithms [17 min.]
- All Logarithms are Natural (or Common)! [15 min.]
- Solving Logarithmic Equations [20 min.]
- Logarithmic Models: Sound (Loudness) & Fury (Earthquakes) [16 min.]

Lecture 31 48:16

EXPONENTIAL FUNCTIONS (con.)

- Solving Exponential Equations [15 min.]
- Exponential Models: Compounded Interest, and Growth & Decay [32 min.]

Lecture 32 1:19:17

UNIT 6 - SYSTEMS OF EQUATIONS

SYSTEMS OF LINEAR EQUATIONS

- Systems of Linear Equations in General [19 min.]
- Solving A System of 2 (or 3) Linear Equations in 2 (or 3) Variables: Substitution [20 min.]
- Solving A System of 2 (or 3) Linear Equations in 2 (or 3) Variables: Elimination [36 min.]

Lecture 33 1:16:05

- Some Exercises Explained [31 min.]
- An Application: Writing Proper Rational Functions As Sums of Simpler Proper Rational Functions (Partial Fractions) [43 min.]

Lecture 34 16:06

SYSTEMS OF NON-LINEAR EQUATIONS

- Solving (Mostly Graphically) a System of 2 Non-Linear Equations in 2 Variables

Lecture 35 57:36

UNIT 7 - SOME DISCRETE TOPICS

SEQUENCES

- Infinite Sequences: Functions with Domain **N** [28 min.]
- The Factorial Symbol: **!** [8 min.]
- Adding The First *n* Terms of a Sequence: *n*th Partial Sums & Summation Notation [17 min.]

Lecture 36 50:13

- Arithmetic Sequences: Adding Your Way to Infinity [18 min.]
- Geometric Sequences: Multiplying Your Way to Infinity [30 min.]

Lecture 37 58:57

SERIES & INDUCTION

- Geometric Series & Their (Infinite) Sums [26 min.]
- The Principle of Mathematical Induction [30 min.]

Lecture 38 1:04:27

THE BINOMIAL THEOREM

- The "Binomial Coefficient" Symbol [11 min.]
- Pascal's Triangle [19 min.]
- The Binomial Theorem: How to Expand $(x + a)^n$ [32 min.]

Lecture 39 1:27:13

THE X-Y FILES: The Proof is in Here

- A Proof that $\sqrt{2}$ is Irrational [7 min.]
- Proof - There Are The Same Number of Rational Numbers as Natural Numbers! [9 min.]
- Proof - There Are More Real Numbers Than Natural Numbers! [13 min.]
- Algebra For Science: Variation [17 min.]
- How Can You Find Rational Zeros (if any) of a Polynomial Function? [21 min.]
- Proof - "*e*" Is Irrational [13 min.]
