

MATHEMATICS

Algebra and Trigonometry

I. ALGEBRA

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A. Basic Properties of the Real Numbers

B. Linear and Quadratic Equations

1. Linear Equations
2. Quadratic Equations
 - a. Equations of the form $x^2 - p = 0$
 - b. Equations of the form $k(x + r)^2 - p = 0$, where $k \neq 0$
 - c. Equations of the form $ax^2 + bx + c = 0$, where $a \neq 0$
 - d. The discriminant

C. Polynomial Equations

1. Equivalent Polynomials
2. Addition and Subtraction of Polynomials
3. Multiplication of Polynomials
4. Division of Polynomials
5. Division of Polynomials and Solving Polynomial Equations
6. Proof of the Rational Root Theorem
7. Proof of the Factor Theorem
8. Complex Numbers
 - a. Addition of complex numbers
 - b. Multiplication of complex numbers
 - c. Division of complex numbers

D. Functions

1. Preliminaries
2. Definition of a Function
3. Many-to-One Functions versus One-to-One Functions
4. Inverse Functions

E. Graphing

1. The Graph of a Linear Function $y = ax + b$
2. The Graph of a Quadratic Function $y = ax^2 + bx + c$
 - a. The case $y = x^2$
3. The Graphs of Polynomials
4. The Graph of the Exponential Function $y = a^x$
5. The Graph of the Logarithmic Function $y = \log_a x$
6. Transformations of Graphs
 - a. Graphing $y = f(x + c)$ from the graph of $y = f(x)$

- b. Graphing $y = f(x) + C$ from the graph of $y = f(x)$
- c. Graphing $y = f(ax)$ from the graph of $y = f(x)$
- d. Graphing $y = Af(x)$ from the graph of $y = f(x)$

F. Non-polynomial Equations

- 1. Rational Equations
 - a. Solving rational equations
 - b. Graphs of rational functions
- 2. Exponential Equations
 - a. Basic properties
 - b. Solving exponential equations
- 3. Logarithmic Equations
 - a. Basic properties
 - b. Solving logarithmic equations
- 4. Radical Equations
 - a. Method 1
 - b. Method 2

G. Inequalities

- 1. Linear Inequalities
- 2. Quadratic Inequalities
 - a. Inequalities of the form $ax^2 + bx + c > 0$ and $a > 0$
 - b. Inequalities of the form $ax^2 + bx + c < 0$ and $a > 0$

H. Coordinate Geometry

- 1. The Pythagorean Theorem
- 2. Points
- 3. Lines
 - a. Slope form
 - b. Point-point form
 - c. Slope-point form
 - d. Mutual positions of lines
- 4. Circles
- 5. Solving Geometry Problems Using Coordinate Geometry

II. TRIGONOMETRY

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A. Trigonometric Functions

- 1. The Sine Function for Acute Angles
- 2. The Tangent Function for Acute Angles
- 3. The Cosine and Cotangent Functions for Acute Angles
- 4. Relations among Trigonometric Functions
- 5. Trigonometric Functions of Special Angles
- 6. Trigonometric Functions of Angles of Any Measure
 - a. Definitions and properties

- b. Negative angles
- 7. Trigonometric Identities
 - a. Sum and difference identities
 - b. Double-angle identities
 - c. Half-angle identities
 - d. Sum-to-product identities
 - e. Product-to-sum identities
- 8. Graphs of Trigonometric Functions
- 9. Inverse Trigonometric Functions
- 10. Trigonometric Equations
- 11. The Law of Sines and Cosines
- 12. Radians