

Mathematics 120A

College Algebra

Outline of Course

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MATH 120A

College Algebra

Course Outline

Chapter 1

§1 Real Numbers

1. Number Systems
2. Properties of operations $+$, \cdot
3. Properties of equality, negatives, reciprocals, $-$ and \div
4. Number line
5. Order, signed numbers
6. Absolute value, distance between points
7. Scientific notation, significant digits

§2 Exponents and Radicals

1. Definition of exponent
2. Laws of exponents
3. Definition of principal root
4. Properties of radicals
5. Simplifying radicals
6. Rationalizing denominators
7. Rational exponents

§3 Algebraic Expressions

1. Terminology
2. Adding/subtracting polynomials
3. Multiplying polynomials
4. Factoring

§4 Fractional Expressions

1. Simplifying algebraic fractions
2. Products & quotients of algebraic fractions
3. Sums & differences of algebraic fractions
4. Complex fractions
5. Rationalizing numerator & denominator
6. Simplifying fractional exponent expressions

Chapter 2

§1 Equations

1. Definitions (60-61)
2. Solving a linear equation, transposition (62-63)
3. Equations involving fractions, extraneous roots (63-65)
4. Solving formulae (65-66)

§2 Applied Problems

1. Averages
2. Financial-discounts, etc.
3. Interest
4. Mixtures, solutions
5. Distance/rate problems
6. Geometric problems
7. Work/rate problems
8. Miscellaneous

§3 Quadratic Equations

1. Definition of quadratic equation (80-81)
2. Solution by factoring (81-83)
3. Solution by completing the square (83-84)
4. Solution by the quadratic formula, discriminant (84-87)
5. Word problems (87-89)

§4 Complex Numbers

1. Definition of complex number, equality, geometric representation (94)
2. Sum & difference of complex numbers (94-95)
3. Multiplication of complex numbers (95-96)
4. Conjugate, quotient (96-98)
5. Radicals (98-99)
6. Equations whose solutions are complex numbers (100)

§5 Other Types of Equations

1. Absolute value equations (102)
2. Solving by factoring (102-103)
3. Equations involving radicals (103-105)
4. Equations of quadratic type (105-106)
5. Word problems (106-107)

§6 Inequalities

1. Definition; intervals (110-111)
2. Properties (112)
3. Solving a linear inequality (112-115)
4. Absolute value inequalities (116-117)

§7 More on Inequalities

1. Continuity & its effect on the sign of a function
2. Method A for solving quadratic inequalities: graphing
3. Method B for solving higher degree & rational inequalities: sign table (119-124)
4. Word problems (124)
5. Additional properties of inequalities (125)

Chapter 3

§1. Rectangular Coordinate Systems

1. Definitions & terminology (132)
2. Distance formula (132-135)
3. Midpoint formula (135-136)

§2. Graphs of Equations

1. Terminology, plotting the graph (141-142)
2. Intercepts (143-144)
3. Symmetry (146-147)
4. Equation of a circle (148-154)

§3. Lines

1. Slope (157-160)
2. Horizontal, vertical lines (161)
3. Point-slope form (162)
4. Slope-intercept form (163)
5. General form (164)
6. Parallel, perpendicular lines (164-167)
7. Linear models (167-170)

§4. Definition of Function

1. Definitions (175-179)
2. Graph of a function, vertical line test (179-180)
3. Increasing, decreasing, constant functions (180-182)
4. Difference quotients (182-183)
5. Linear functions (183-185)
6. Word problems (185-186)
7. Alternative definition of function (186)

§5. Graphs of Functions

1. Even, odd functions (193-194)
2. Absolute value function (194)
3. Vertical shifts (194-195)
4. Horizontal shifts (195-196)
5. Vertical compression, dilation (197)
6. Reflection about axes (197-198)
7. Horizontal compression, dilation (198-199)
8. Piecewise-defined functions (199-202)

9. Greatest integer function (202-203)
10. Graph containing an absolute value (203-204)

§6. Quadratic Functions

1. Definition, graph (209).
2. Canonical form (210-212)
3. Location of vertex, extrema (213-214)
4. Applied problems (216-219)

§7. Operations on Functions

1. Sum, difference, product, quotient (224-226)
2. Kinds of functions (226)
3. Composition (226-232)

Chapter 4

§1. Polynomial Functions of Degree Greater Than 2

1. Continuity, power functions (262)
2. Intermediate value theorem (263)
3. Intervals determined by zeroes (265-267)
4. Approximating a polynomial by a power function; long-term behaviour
5. Multiplicity of a zero, effect on graph

§2. Properties of Division

1. Division algorithm (273-274)
2. Remainder theorem (274)
3. Factor theorem (275)
4. Synthetic division (276-278)

§3. Zeroes of Polynomials

1. Fundamental theorem of algebra (281)
2. Complete factorization theorem (281-283)
3. Multiplicity (283-284)
4. Descartes' rule of signs (286-287)
5. Bounds on roots (287-291)

§4. Complex and Rational Zeros of Polynomials

1. Complex zeroes occur in conjugate pairs (295-296)
2. Real-coefficient polynomial can be factored into linear & irreducible quadratic factors (296-297)
3. Theorem on rational zeroes (297-301)

§5. Rational Functions

1. Domain (303-304)
2. Vertical asymptotes (304-306)
3. Horizontal asymptotes (306-309)
4. Graphing rational functions (309-318)
5. Oblique asymptotes (315-317)

§6. Variation

1. Direct & inverse variation (245-246)
2. Applied problems (247-249)
3. Joint variation (248)

Chapter 9

§1. Systems of Equations

1. Systems of equations, solutions to same, geometric meaning (626)
2. Solution by method of substitution (626-629)
3. Extension to systems of three equations (629-632)

§2. Systems of Linear Equations in Two Variables

1. Definition, equivalent systems (635-636)
2. Operations on systems that preserve equivalence (636)
3. Graphical interpretation of a system (637)
4. Method of elimination (637-639)
5. Classification of systems (638)
6. Word problems (639-641)

§3. Systems of Inequalities

1. Definitions (644)
2. Method of solution (645)
3. Linear inequalities, systems of linear inequalities (645-646)
4. Examples and applications (647-648)

§4. Linear Programming

1. Constraints, feasible solutions, objective function (653-654)
2. Main theorem of linear programming (654)
3. Solution of the linear programming problem (654-656)
4. Applied problems (656-659)

§5. Systems of Linear Equations in More Than Two Variables

1. Method of elimination applied to 3 by 3 systems; back substitution (662)
2. Nature of solutions (662-663)
3. Matrix representation of a system (663-664)
4. Matrix terminology (664)
5. Elementary row transformations; equivalent systems (665)
6. Solving a system by elementary row transformations (665-666)
7. Echelon form of a matrix (666-669)
8. Reduced echelon form of a matrix (669-671)
9. Homogeneous systems (672-673)
10. Applied problems (673-675)

§6. The Algebra of Matrices

1. Equality, addition (677-679)
2. Scalar product (679-680)
3. Matrix product (680-684)
4. Row matrices, column matrices (683)
5. Application (684-685)

§7. The Inverse of a Matrix

1. Identity matrices (687-688)
2. Inverse of a matrix (688-690)
3. Application to solving systems (691-692)

§8. Determinants

1. Symbols, definition of 2×2 determinant (694-695)
2. Minor, cofactor (695-696)
3. Definition of 3×3 determinant (696-698)
4. General expansion (698-699)
5. Row of zeroes, matrix invertibility (699)