TAFT COLLEGE
West Kern Community College District

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Mathematics (MATH) 1060 Intermediate Algebra (4 Units)
[formerly Mathematics 52; Mathematics 29]

Prerequisite: Qualification by assessment process or completion of Mathematics 1050 or one year of high school algebra with a grade of "C" or higher.

Prerequisite knowledge/skills:

Before entering the course the student should be able to:

1. use inequality symbols and exponents, and apply order of operations rules in complex calculations,
2. identify numbers as belonging to specified sets, such as integers or rational numbers, and graph such numbers on the real number line,
3. perform the basic arithmetic operations with positive and negative real numbers,
4. know the properties of addition and multiplication for real numbers and identify their use in practice,
5. solve linear equations and inequalities in one variable, and analyze and solve word problems leading to linear equations,
6. solve formulas for specified variables and use the resulting equations in solving word problems,
7. set up and solve word problems involving the use of ratios and proportions,
8. know and apply the rules of exponents using integral exponents, and use scientific notation,
9. perform addition, subtraction, multiplication and division of polynomials,
10. factor simple polynomials, with special emphasis on quadratic trinomials and special factorizations, and solve related polynomial equations,
11. analyze and solve word problems requiring the setting up and solution of factorable quadratic equations,
12. graph points representing specified ordered pairs using a standard two dimensional rectangular coordinate systems. Graph a straight line from ordered pairs obtained from its equation,
13. determine the slope of a line between any specified pair of points,
14. know the slope-intercept and point-slope forms of the equation of a straight line, and be able to determine the equation of a particular straight fine from specified input information,
15. solve and graph linear inequalities in two variables,
16. solve linear systems of equations in two variables both graphically and algebraically, and recognize inconsistent and dependent systems,

17. analyze and solve word problems requiring the use of linear systems of equations in two variables,
18. solve linear systems of inequalities in two variables graphically, and
19. find the value of integral roots of positive real numbers

Advisory: Eligibility for English 1000 and Reading 1005 strongly recommended

Total Hours: 64 hours lecture

Catalog Description: This regular course in intermediate algebra includes solutions of first and second degree equations and inequalities, exponents and radicals, logarithms, and the algebra of polynomials.

Type of Class/Course: Degree Credit

Text: Lial, Margaret, et al. *Introductory and Intermediate Algebra.* 5th ed. Pearson, 2018.

Additional Instructional Materials:

Online Videos available
Via My Math Lab, an online homework, tutorial and assessment system at www.mymathlab.com

Course Objectives:

By the end of the course, a successful student will be able to:

1. identify numbers as belonging to specified sets, and graph discrete and continuous sets of real numbers,
2. perform the basic arithmetic operations with positive and negative real numbers, plus raising to powers,
3. know and apply the rules of exponents and the order of operations in algebraic calculations,
4. apply the properties of addition and multiplication for real numbers and identify their use in practice,
5. solve linear equations and inequalities in one variable, and analyze and solve applications leading to such equations or inequalities,
6. solve and graph the solutions of compound inequalities or absolute value inequalities in one variable,
7. perform addition, subtraction, multiplication and division of polynomials,
8. factor simple polynomials, with special emphasis on trinomials quadratic in form, and solve related polynomial equations,
9. add, subtract, multiply and divide rational algebraic expressions, and simplify to lowest terms,
10. solve equations involving rational algebraic expressions, and analyze and solve word problems leading to such equations,
11. simplify radical expressions involving numbers and/or variables,
12. use fractional exponents,

13. perform addition, subtraction, multiplication and division of expression involving radicals and complex numbers and simplify the results, including rationalization of denominators,
14. solve equations that involve radicals,
15. solve quadratic equations in one variable, and equations quadratic in form, by factoring, completing the square, and the quadratic formula,
16. analyze and solve application problems requiring the use of quadratic equations,
17. solve and graph quadratic inequalities in one variable,
18. graph points in the rectangular coordinate system, and straight lines from ordered pairs obtained from its equation,
19. determine the slope of the line between any specified pair of points,
20. know the slope forms of the equation of a straight line, and be able to determine the equation of a particular straight line from specified input information,
21. solve and graph linear inequalities in two variables,
22. solve linear systems of equations in two or three variables algebraically, and solve those in two dimensions graphically,
23. analyze and solve application problems requiring the use of linear systems of equations in two or three variables,
24. evaluate determinants and use them to solve linear systems of equations,
25. determine whether or not a specified relation is a function,
26. for a function, compute the value of the function given the value of the independent variable, and be able to construct the inverse of simple functions in numeric or algebraic terms,
27. identify the quadratic equation representing a specific conic section, and be able to draw the graph of a conic section by analyzing its equation, or to write the equation of a specified conic section,
28. solve nonlinear systems of equation involving the intersection of two conic sections or a conic section and a straight line,
29. compute and graph specified exponential and logarithmic functions,
30. know the properties of logarithms (product, quotient, power and change of base rules) and be able to use them in practical numerical computations using a table of common logarithms or a calculator, and
31. solve simple exponential and logarithmic equations.

Course Scope and Content:

Unit I Review of Linear Equations

A. Decide whether a number is a solution of a linear equation,
B. Solve linear equations with fractions or decimals using the addition, multiplication or distributive properties, and
C. Identify conditional equations, contradictions, and identities.

Unit II Graphs, Linear Equations and Functions

A. Plot ordered pairs.
B. Find ordered pairs that satisfy a given equation,

C. Find x- and y- intercepts,
D. Recognize equations of horizontal and vertical lines,
E. Find the slope of a line given two points on the line,
F. Find the slope of a line given an equation of the line,
G. Graph a line given its slope and a point on the line,
H. Use slopes to determine whether two lines are parallel, perpendicular, or neither,
I. Solve problems involving average rate of change,
J. Write an equation of a line given its slope and y-intercept,
K. Graph a line using its slope and y-intercept,
L. Write an equation of a line given two points on the line,
M. Write an equation of a line parallel or perpendicular to a given line,
N. Write an equation of a line that models real data,
O. Graph linear inequalities in two variables,
P. Graph the intersection of two linear inequalities,
Q. Graph the union of two linear inequalities,
R. Define and identify relations and functions,
S. Find domain and range,
T. Identify functions defined by graphs and equations,
U. Use function notation, and
V. Identify linear functions.

Unit III Systems of Linear Equations

A. Solve linear systems by graphing,
B. Decide whether an ordered pair is a solution of a linear system,
C. Solve linear systems (with two equations and two variables) by substitution,
D. Solve linear systems (with two equations and two variables) by elimination,
E. Solve special systems,
F. Solve problems using two variables,
G. Solve money problems using two variables, and
H. Solve distance-rate-time problems using two variables.

Unit IV Exponents and Polynomials, and Polynomial Functions

A. Use the product rule for exponents,
B. Define 0 and negative exponents,
C. Use the quotient rule for exponents,
D. Use the power rules for exponents,
E. Simplify exponential expressions,
F. Use the rules for exponents with scientific notation,
G. Know the basic definitions for polynomials,
H. Find the degree of a polynomial,
I. Add and subtract polynomials,
J. Recognize and evaluate polynomial functions,
K. Use a polynomial function to model data,
L. Add and subtract polynomial functions,
M. Graph basic polynomial functions,

N. Multiply terms,
O. Multiply and two polynomials,
P. Multiply binomials,
Q. Find the product of the sum and difference of two terms,
R. Find the square of a binomial,
S. Multiply polynomial functions,
T. Divide a polynomial by a monomial,
U. Divide a polynomial by a polynomial of two or more terms, and
V. Divide polynomial functions.

Unit V Factoring

A. Factor out the greatest common factor,
B. Factor by grouping,
C. Factor trinomials when the coefficient of the squared term is 1,
D. Factor trinomials when the coefficient of the squared term is not 1,
E. Use an alternative method for factoring trinomials,
F. Factor by substitution,
G. Factor a difference of squares,
H. Factor a perfect square trinomial,
I. Factor a difference of cubes,
J. Factor a sum of cubes,
K. Learn and use the zero-factor property, and
L. Solve applied problems that require the zero-factor property.

Unit VI Rational Expressions and Functions

A. Define rational expressions,
B. Define rational functions and describe their domain,
C. Write rational expressions in lowest terms,
D. Multiply rational expressions,
E. Find reciprocals for rational expressions,
F. Divide rational expressions,
G. Add and subtract rational expressions with same denominators,
H. Find the least common denominator,
I. Add and subtract rational expressions with different denominators,
J. Simplify complex fractions by simplifying the numerator,
K. Simplify complex fractions by multiplying by a common denominator,
L. Simplify rational expressions with negative exponents,
M. Determine the domain of a rational equation,
N. Solve rational equations,
O. Recognize the graph of a rational function,
P. Find the value of an unknown variable in a formula,
Q. Solve a formula for a specified variable,
R. Solve applications using proportions,
S. Solve applications about distance, rate, and time, and
T. Solve applications about work rates.

Unit VII Roots, Radical, and Root Functions

A. Find roots of numbers,
B. Find principal roots,
C. Graph functions defined by radical expressions,
D. Find nth roots of nth powers,
E. Use a calculator to find roots,
F. Use exponential notation for nth roots,
G. Define $\overline{a^{\frac{m}{n}}}$,
H. Convert between radicals and rational expressions,
I. Use the rules for exponents with rational exponents,
J. Use the product rule for radicals,
K. Simplify radicals,
L. Simplify products and quotients of radicals with different indexes,
M. Use the Pythagorean formula,
N. Use the distance formula,
O. Simplify radical expressions involving addition and subtraction,
P. Multiply radical expressions,
Q. Rationalize denominators with one radical term,
R. Rationalize denominators with binomials involving radicals,
S. Write radical quotients in lowest terms,
T. Solve radical equations using the power rules,
U. Solve radical equations that require additional steps,
V. Solve radical equations with indexes greater than 2,
W. Simplify numbers of the form $\sqrt{b},$ where b>0,
X. Recognize subsets of the complex numbers,
Y. Add and subtract complex numbers,
Z. Multiply complex numbers,
AA. Divide complex numbers, and
BB. Find powers of i.

Unit VIII Quadratic Equations, Inequalities and Functions

A. Learn the square root property,
B. Solve quadratic equations of the form $(ax+b)^2 = c$ by using the square root property,
C. Solve quadratic equations by completing the square,
D. Solve quadratic equations with non-real complex solutions,
E. Derive the quadratic formula,
F. Solve quadratic equations using the quadratic formula,
G. Use the discriminant to determine the number of solutions and type of solutions,
H. Solve an equation with fractions by writing it in quadratic form,
I. Use quadratic equations to solve applied problems,
J. Solve an equation with radicals by writing it in quadratic form,
K. Solve an equation that is quadratic in form by substitution,

L. Solve formulas for variables involving square roots,
M. Solve applied problems using the Pythagorean formula,
N. Solve applied problems using area formulas,
O. Solve applied problems using quadratic functions as models,
P. Graph a quadratic function,
Q. Graph parabolas with horizontal and vertical shifts,
R. Predict the shape and direction of a parabola from the coefficient of x^2,
S. Find a quadratic function to model data,
T. Find the vertex of a vertical parabola,
U. Graph a quadratic function,
V. Use the discriminant to find the number of x-intercepts of a vertical parabola,
W. Use quadratic functions to solve problems involving maximum or minimum value,
X. Graph horizontal parabolas,
Y. Solve quadratic inequalities,
Z. Solve polynomial inequalities of degree 3 or more, and
AA. Solve rational inequalities.

Unit IX Exponential and Logarithmic Functions

A. Decide whether a function is one-to-one and, if it is, find its inverse,
B. Use the horizontal line test to determine whether a function is one-to-one,
C. Find the equation of the inverse of a function,
D. Graph f^{-1} from the graph of f,
E. Define exponential functions,
F. Graph exponential functions,
G. Solve exponential equations of the form $a^x = a^k$ for x,
H. Use exponential functions in applications involving growth or decay,
I. Define logarithm,
J. Convert between exponential and logarithmic forms,
K. Solve logarithmic equations of the form $\log_a b = k$ for a, b, or k,
L. Define and graph logarithmic functions,
M. Use logarithmic functions in applications of growth or decay,
N. Use the product rule for logarithms,
O. Use the quotient rule for logarithms,
P. Use the power rule for logarithms,
Q. Use properties to write alternative forms of logarithmic expressions,
R. Evaluate common logarithms using a calculator,
S. Use common logarithms in applications,
T. Evaluate natural logarithms using a calculator,
U. Use natural logarithms in applications,
V. Solve equations involving variables in the exponents,
W. Solve equations involving logarithms,
X. Solve applications of compound interest,
Y. Solve applications involving base e exponential growth and decay, and
Z. Use the change-of-base rule.

Learning Activities Required Outside of Class:

The students in this class will spend a minimum of 8 hours per week doing the following:

1. Studying
2. Skill practice
3. Completing assignments
4. Working in mathematics lab with tutor as necessary

Methods of Instruction:

1. Lecture-demonstrations and simple problems solved by the instructor,
2. Occasional lab activities on the computer and/or calculator, and
3. Demonstrations and interactive lessons from the Internet.

Methods of Evaluation:

1. Computational or non-computational problem solving demonstrations including:
2. exams,
3. homework problems,
4. quizzes,
5. projects, and
6. final examination.