LAKELAND COMMUNITY COLLEGE – COURSE OUTLINE FORM

Course Title changed to "College Algebra (A)", effective spring 2024.

ORIGINATION DATE:	8/2/99	**APPROVAL DATE:**	5/1/23
LAST MODIFICATION DATE:	5/10/23	**EFFECTIVE TERM/YEAR:**	SPRING/ 24

PRINTED: 10/3/2023

COURSE ID: MATH1650
COURSE TITLE: College Algebra (A)

	LECTURE	LAB	CLINICAL	TOTAL	OBR MIN	OBR MAX
CREDITS:	4.00	0.00	0.00	4.00	4.00	4.00
CONTACT HOURS:	4.00	0.00	0.00	4.00		

PREREQUISITE:

a grade of "SC" or better in MATH 0950 or placement test

COURSE DESCRIPTION:

This course investigates relations and functions numerically, analytically, and graphically. Topics include solutions of polynomial and rational equations and inequalities; exponential and logarithmic equations; systems of linear and non-linear equations; conic sections; sequences and series; and mathematical modeling. Students will need to supply a graphing utility; the instructor will provide details.

RATIONALE FOR COURSE:

This course provides a college-level study of algebra and also serves as a foundation course for the study of advanced mathematics.

OUTCOMES:
The course will

1.   Develop an understanding of functions, relations, their graphs, and how to use them to model and solve applications and real-world problems.

2.   Introduce students to the power of visualization of mathematics in solving problems.

3.   Demonstrate the use of graphing utilities as a tool in the study of functions, relations, equations, and their systems.

4.   Develop students' ability to solve problems analytically and graphically using a variety of methods.

5.   Develop students' ability to read, write, and speak mathematically.

6.   Further strengthen students' ability to critically apply mathematical thinking to solve problems and determine reasonableness of results.

PERFORMANCE INDICATORS:
Upon completion of the course, the student should be able to

1.   Perform arithmetic operations and graph relations and functions by hand as well as with a graphing utility.

2.   Change the form of a relation to a sequence of functions.

3.   Interpret the slope of a linear function as an average rate of change.

4.   Graph several families of functions by hand and/or using a graphing utility. Express orally and in writing the similarities and/or differences of the behavior of the graphs of families of functions.

5.   Use analytical and graphical methods to solve mathematical modeling problems involving linear, quadratic, higher order polynomial, rational, root, radical, power, exponential, and logarithmic functions. Identify and state restrictions on the domain and range in the context of the problem situation.

6.   Calculate the distance between two points on a number line and in the plane.

7.   Use a graphing utility to obtain the solution of an equation to a desired degree of accuracy.

8.   Solve a system of equations analytically and graphically.

9.   State the relationship between the zero of a function, the root of the equation, and the graphical representation of the equation.

10.   Analytically determine the end behavior of functions in order to recognize when a graphing utility displays a complete graph of the function.

11.   Find all complex roots of a higher degree equation using a combination of analytic and graphical techniques.

12.   Graph exponential and logarithmic functions by hand and using a utility. Solve exponential and logarithmic equations analytically and using a utility.

13.   Identify equations of various conic sections and state their characteristics.

14.   Solve problems using pattern recognition, progressions, sequences, and series.

COURSE OUTLINE:

I.   Functions and Relations
      A.   Expressing relations verbally, numerically, graphically
      B.   Distinguishing which relations are functions.
            1.   Vertical Line Test
      C.   Function notation and evaluating functions
            1.   Piecewise defined functions
      D.   Modeling with functions
      E.   Domain and range
      F.   Graphs of functions
            1.   Intervals of increase, decrease, and constant
            2.   Intercepts
            3.   Symmetry (even and odd)
            4.   Transformations
      G.   Combinations of functions
            1.   Sums and differences
            2.   Products and quotients
            3.   Function composition
            4.   Function inverse
                  a.   One-to-one functions
                  b.   Horizontal Line Test
                  c.   Finding and verifying the formula for a function inverse

II. Linear and Absolute Value Functions and their Graphs
      A.   Domain and range
      B.   Increasing, decreasing, and constant
      C.   Interpreting slope as an average rate of change
      D.   Applications including modeling with linear functions

III. Quadratic Functions
      A.   Domain and range
      B.   Graphs of quadratic functions
            1.   Intervals of increase and decrease
            2.   Vertex
            3.   Relative extrema
            4.   Axis of symmetry
      C.   Zeros of quadratic functions
      D.   Solving quadratic inequalities analytically and graphically
            1.   Continuity
                  a.   Intermediate Value Theorem
      E.   Applications including modeling with quadratic functions

IV. Higher Order Polynomial Functions
      A.   Domain and range
      B.   Graphs of polynomial functions
            1.   Intervals of increase and decrease
            2.   End behavior
            3.   Relative extrema
            4.   Even and odd
            5.   Continuity
                  a.   Intermediate Value Theorem
      C.   Zeros of Polynomial Functions
            1.   The role of multiplicity
            2.   Remainder and Factor Theorems
            3.   Rational Zeros Theorem
            4.   Fundamental Theorem of Algebra
            5.   Complete factorization
      D.   Solving polynomial inequalities analytically and graphically
      E.   Applications including modeling with polynomial functions

V.   Rational Functions
      A.   Domain and range
      B.   Graphs of rational functions
            1.   Intervals of increase and decrease
            2.   End behavior (horizontal or oblique asymptote)
            3.   Relative extrema
            4.   Even and odd
            5.   Vertical asymptotes
            6.   Holes in the graph
            7.   Continuity
            8.   Intercepts
      C.   Solving rational inequalities analytically and graphically
      D.   Applications including modeling with rational functions

VI. Root, Radical, and Power Functions
      A.   Domain and range
      B.   Graphs
            1.   Intervals of increase and decrease
            2.   End behavior
            3.   Even and odd
            4.   Continuity
            5.   Intercepts
      C.   Applications including modeling with root, radical, and power
            functions

VII.   Exponential Functions
      A.   Domain and range
      B.   Graphs
           1.   Intervals of increase and decrease
           2.   End behavior
           3.   Continuity
           4.   Intercepts
      C.   Solving equations involving exponential functions
      D.   Applications including modeling with exponential functions

VIII. Logarithmic Functions
      A.   Domain and range
      B.   Graphs
           1.   Intervals of increase and decrease
           2.   End behavior
           3.   Continuity
           4.   Intercepts
      C.   Properties of logarithms
      D.   Solving equations involving logarithmic functions
      E.   Applications including modeling with logarithmic functions

IX.   Systems of Equations
      A.   Solving systems of linear equations analytically (substitution and elimination) and graphically.
      B.   Solving systems of non-linear equations analytically (substitution and elimination) and graphically.

X.   Conic Sections
      A.   Circles
           1.   Distance formula and midpoint formula
      B.   Parabolas
      C.   Ellipses
      D.   Hyperbolas

XI.   Sequences and Series
      A.   Sequence and summation notation
      B.   Arithmetic and geometric sequences
      C.   Geometric series
      D.   Binomial Theorem

INSTRUCTIONAL PROCEDURES THAT MAY BE UTILIZED:

Lecture/discussion
Computer/graphing calculator based activities
Group and/or individual activities
Research projects utilizing real data gathered from the Internet or other sources

---

GRADING PROCEDURES:

It is recommended that the instructors have at least five evaluative items on which to determine the student's course grade. In general, tests are given covering lecture and homework assignments.

COURSE EVALUATION PROCEDURES:

Formal and informal feedback from students and faculty
Review of student performance in subsequent mathematics courses

LAKELAND LEARNING OUTCOMES

LEARNS ACTIVELY	I	R	D
1. Takes responsibility for his/her own learning.			D
2. Uses effective learning strategies.			
3. Reflects on effectiveness of his/her own learning strategies.			

THINKS CRITICALLY	I	R	D
4. Identifies an issue or idea.			
5. Explores perspectives relevant to an issue or idea.			
6a. Identifies options or positions.			
6b. Critiques options or positions.			
7. Selects an option or position.			D
8a. Implements a selected option or position.			
8b. Reflects on a selected option or position.			

COMMUNICATES CLEARLY	I	R	D
9a. Uses correct spoken English.			
9b. Uses correct written English.			
10. Conveys a clear purpose.			
11. Presents ideas logically.			D
12a. Comprehends the appropriate form(s) of expression.			D
12b. Uses the appropriate form(s) of expression.			D
13. Engages in an exchange of ideas.			

USES INFORMATION EFFECTIVELY	I	R	D
14. Develops an effective search strategy.			
15a. Uses technology to access information.			D
15b. Uses technology to manage information.			
16. Uses selection criteria to choose appropriate information.			
17. Uses information responsibly.			

INTERACTS IN DIVERSE ENVIRONMENTS	I	R	D
18a. Demonstrates knowledge of diverse ideas.			
18b. Demonstrates knowledge of diverse values.			
19. Describes ways in which issues are embedded in relevant contexts.			
20a. Collaborates with others.			
20b. Collaborates with others in a variety of situations.			
21. Acts with respect for others.			

Definitions:

Introduces (I)

Students first learn about key ideas, concepts, or skills related to the performance indicator. This usually happens at a general or very basic level, such as learning one idea or concept related to the broader outcome.

Reinforces (R)

Students are given the opportunity to synthesize key ideas of skills related to the performance indicator at increasingly proficient levels.

Demonstrates (D)

Students should demonstrate mastery of the performance indicator with the level of independence expected of a student attaining an associate's degree.