Las Positas College
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Course Outline for MATH 33

FINITE MATHEMATICS

Effective: Fall 2019

I. CATALOG DESCRIPTION:
MATH 33 — FINITE MATHEMATICS — 4.00 units

Linear functions, systems of linear equations and inequalities, exponential and logarithmic functions and applications, matrices, linear programming, mathematics of finance, sets and Venn diagrams, combinatorial techniques and an introduction to probability. Applications in business, economics and social sciences.

4.00 Units Lecture

Prerequisite
MATH 55 - Intermediate Algebra for BSTEM
with a minimum grade of C
or

MATH 55B - Intermediate Algebra for STEM B
with a minimum grade of C
or

MATH 50 - Intermediate Algebra for SLAM
with a minimum grade of C
or

NMAT 250 - Intermediate Algebra for SLAM
with a minimum grade of C
or

NMAT 255 - Intermediate Algebra for BSTEM
with a minimum grade of C

Grading Methods:
Letter Grade

Discipline:
- Mathematics

	MIN
Lecture Hours:	72.00
Expected Outside of Class Hours:	144.00
Total Hours:	216.00

II. NUMBER OF TIMES COURSE MAY BE TAKEN FOR CREDIT: 1

III. PREREQUISITE AND/OR ADVISORY SKILLS:
Before entering the course a student should be able to:

A. MATH55
1. Recognize and determine the distinctions between relations and functions, numerically, graphically, symbolically, and verbally;
2. Given a function, determine the domain and range and express them in interval notation;
3. Solve polynomial, rational, absolute value, radical, linear, exponential, and logarithmic equations;
4. Apply basic operations on functions, including composition of functions and finding inverse functions;
5. Solve systems of linear equations in three variables;
6. Develop and use equations or function models to analyze and solve applied problems involving linear, quadratic, rational, radical, exponential or logarithmic expressions. Topics should minimally include growth, decay, geometry, optimization and uniform motion.
7. Factor polynomials, including using the sum and difference of cubes;
8. Use the properties of radicals, complex numbers, exponents and logarithms;

B. MATH55B
1. Solve polynomial, rational, absolute value, radical, linear, exponential, and logarithmic equations;
2. Apply basic operations on functions, including composition of functions and finding inverse functions;
3. Solve systems of linear equations in three variables;
4. Develop and use equations or function models to analyze and solve applied problems involving linear, quadratic, rational, radical, exponential or logarithmic expressions. Topics should minimally include growth, decay, geometry, optimization and uniform motion.
5. Use the properties of radicals, complex numbers, exponents and logarithms;

C. MATH50
1. Explain and/or justify the solution process orally or in writing
2. Use algebraic operations to simplify polynomial, rational and radical expressions
3. Simplify radicals and use properties of exponents to simplify expressions with integer or rational exponents
4. Create equations in one variable and use them to solve problems. (Include equations arising from polynomial functions, and simple rational, radical, exponential and logarithmic functions.)
5. Solve quadratic equations using factoring, the square root property or the quadratic formula
6. Represent and solve equations graphically. (includes: polynomial, radical, rational, exponential, and logarithmic functions; by hand or using technology)
7. Explain and use the relationship between zeros and factors of polynomials
8. Solve a formula for a specified variable
9. Determine whether a mathematical structure is a relation or function, find the domain and range and express them in interval, inequality or set notation (includes: polynomial, radical, rational, exponential, and logarithmic functions)
10. Represent functions verbally, symbolically, numerically and graphically and use function notation
11. Analyze the behavior of a function (e.g., intercepts, intervals of increase/decrease) and sketch its graph with appropriate labels and scales (includes: polynomial, radical, rational, exponential, and logarithmic functions)
12. Apply transformations to the graphs of relations and functions (horizontal and vertical translation, reflection in the x - or y -axis, dilation and contraction) (includes: polynomial, radical, rational, exponential, and logarithmic functions)
13. Perform operations with functions, including composition of functions (includes: polynomial, radical, rational, exponential, and logarithmic functions)
14. Determine whether or not a function is one-to-one
15. Find the inverse of an invertible function, state its domain and range, and sketch its graph
16. Select and use the appropriate technology to represent and analyze graphs and functions
17. Solve applied problems with functions (includes: polynomial, radical, rational, exponential, and logarithmic functions)
18. Construct, use and interpret mathematical models (includes: polynomial, radical, rational, exponential, and logarithmic functions)
19. Compare linear, quadratic and exponential change
20. Construct and interpret data charts, tables and graphs with appropriate labels and scales
21. Apply linear regression to a scatter plot and interpret the result
22. Calculate the probability of an event using the equally likely probability formula, the properties of probability, the sum rule, the product rule or a tree diagram
23. Find and use a probability distribution

D. NMAT250
1. Explain and/or justify the solution process orally or in writing
2. Use algebraic operations to simplify polynomial, rational and radical expressions
3. Simplify radicals and use properties of exponents to simplify expressions with integer or rational exponents
4. Create equations in one variable and use them to solve problems. (Include equations arising from polynomial functions, and simple rational, radical, exponential and logarithmic functions.)
5. Solve quadratic equations using factoring, the square root property or the quadratic formula
6. Represent and solve equations graphically. (includes: polynomial, radical, rational, exponential, and logarithmic functions; by hand or using technology)
7. Explain and use the relationship between zeros and factors of polynomials
8. Solve a formula for a specified variable
9. Determine whether a mathematical structure is a relation or function, find the domain and range and express them in interval, inequality or set notation (includes: polynomial, radical, rational, exponential, and logarithmic functions)
10. Represent functions verbally, symbolically, numerically and graphically and use function notation
11. Analyze the behavior of a function (e.g., intercepts, intervals of increase/decrease) and sketch its graph with appropriate labels and scales (includes: polynomial, radical, rational, exponential, and logarithmic functions)
12. Apply transformations to the graphs of relations and functions (horizontal and vertical translation, reflection in the x - or y -axis, dilation and contraction) (includes: polynomial, radical, rational, exponential, and logarithmic functions)
13. Perform operations with functions, including composition of functions (includes: polynomial, radical, rational, exponential, and logarithmic functions)
14. Determine whether or not a function is one-to-one
15. Find the inverse of an invertible function, state its domain and range, and sketch its graph
16. Select and use the appropriate technology to represent and analyze graphs and functions
17. Solve applied problems with functions (includes: polynomial, radical, rational, exponential, and logarithmic functions)
18. Construct, use and interpret mathematical models (includes: polynomial, radical, rational, exponential, and logarithmic functions)
19. Compare linear, quadratic and exponential change
20. Construct and interpret data charts, tables and graphs with appropriate labels and scales
21. Apply linear regression to a scatter plot and interpret the result
22. Calculate the probability of an event using the equally likely probability formula, the properties of probability, the sum rule, the product rule or a tree diagram
23. Find and use a probability distribution

E. NMAT255
1. Recognize and determine the distinctions between relations and functions, numerically, graphically, symbolically, and verbally;
2. Given a function, determine the domain and range and express them in interval notation;
3. Solve polynomial, rational, absolute value, radical, linear, exponential, and logarithmic equations;
4. Apply basic operations on functions, including composition of functions and finding inverse functions;
5. Solve systems of linear equations in three variables;
6. Develop and use equations or function models to analyze and solve applied problems involving linear, quadratic, rational, radical, exponential or logarithmic expressions. Topics should minimally include growth, decay, geometry, optimization and uniform motion.
7. Factor polynomials, including using the sum and difference of cubes;
8. Use the properties of radicals, complex numbers, exponents and logarithms;

IV. MEASURABLE OBJECTIVES:

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

A. Apply linear and exponential graphs and functions;

B. Identify the three types of solutions of a linear system;
C. Use Gauss-Jordan elimination to put a matrix into reduced row echelon form;
D. Write a system of linear equations to solve an applied problem;
E. Perform operations with data matrices and interpret the result;
F. Solve a system of linear equations using Gauss-Jordan elimination and interpret the result;
G. Find the inverse of a square matrix and use the inverse to solve a system of linear equations;
H. Determine graphically the solution of a system of linear inequalities;
I. Solve linear programming problems in at least three variables;
J. Use graphical methods to solve a linear programming problem in two variables;
K. Find unions, intersections and complements of sets, and use Venn diagrams to solve problems;
L. Use Venn diagrams to solve problems;
M. Apply basic combinatorial principles to enumeration problems;
N. Demonstrate an understanding of the basic definitions of elementary probability;
O. Determine the probability distribution for a sample space (uniform or nonuniform);
P. Determine the probability that a specified event will occur;
Q. Find the conditional probability of an event; and
R. Solve applied problems in finance including simple and compound interest, future and present value, annuities, sinking funds, and amortization.

V. CONTENT:
A. Review linear, exponential and logarithmic equations and functions,
1. Graphing linear functions by hand and with a calculator
2. Graphing exponential and logarithmic functions by hand and with a calculator
3. Applicatons of exponential and logarithmic functions
B. Applications of linear functions to economics
1. Cost, revenue and profit functions
2. Supply and demand equations
3. Break-even point
4. Market equilibrium
5. Estimating intersection points with a calculator
C. Systems of linear equations
1. Substitution and elimination
2. Types of solutions
3. Applications
D. Matrices
1. Gauss-Jordan elimination and reduced-row echelon form
a. Reducing a matrix without using matrix functions on a calculator
b. Using a calculator to reduce a matrix
2. Matrix algebra
a. Addition and multiplication of matrices by hand calculations
b. Using a calculator to add and multiply matrices
3. Inverse matrix method for solving systems of linear equations
a. Finding the inverse by hand calculations
b. Using a calculator to find the inverse
4. Applications
E. Linear programming
1. Graphical solution of a system of linear inequalities
2. Formulation of a linear program in two and three variables
3. Graphical solution of linear programming problems in two variables
4. Solve linear programing problems in at least three variables
F. Math of finance
1. Simple and compound interest
2. Future amount and present value
3. Annuities, sinking funds and amortization
4. Using the calculator to evaluate complex formulas
G. Set Theory
1. Subsets, set equality, union, intersection and complement
2. Set builder notation
3. DeMorgan's Laws
4. Venn diagrams
H. Combinatorics
1. Number of elements in a finite set
2. Number of elements in the union of two or three sets
3. Sum and product rules
4. Permutation and combination
5. Combinatorial functions on the calculator
I. Probability
1. Basic definitions of probability theory
2. Probability distributions
3. Finding the probability of an event, given the probabilities of the simple events in a sample space
4. Use of combinatorial principles to determine the probability of an event
5. Conditional probability
6. Independence of two events
7. Bayes Theorem (optional)

VI. METHODS OF INSTRUCTION:
A. **Lecture** -
B. **Discussion** -
C. Any of the following at the discretion of the instructor 1. Individual problem solving 2. Group work 3. Student presentations
D. Reading
E. **Demonstration** -

VII. TYPICAL ASSIGNMENTS:
A. Assign exercises from the exercise sets at the end of each section. Typical problems would be
1. The Coffee Shoppe sells a coffee blend made from two coffees, one costing $2.50/lb and the other costing $3.00/lb. If the blended coffee sells for $2.80/lb, find how much of each coffee is used to obtain the desired blend. (Assume the weight of the blended coffee is 100 lb.)
2. Find how much money should be deposited in a bank paying interest at the rate of 8.5%/year compounded quarterly so that at the end of 5 years the accumulated amount will be $40,000

3. A member of a book club wishes to purchase two books from a selection of eight books recommended for a certain month. In how many ways can she choose them?
4. Five hundred people have purchased raffle tickets. What is the probability that a person holding one ticket will win the first prize? What is the probability that he or she will not win the first prize?

B. Group work.
1. A typical collaborative activity would be to ask the students to form a group with two other students and to write a system of linear equations to solve the following problem: An electronics company produces three models of stereo speakers, models A, B, and C, and can deliver them by truck, van or station wagon. A truck holds 2 boxes of model A, 1 of model B, and 3 of model C. A van holds 1 box of model A, 3 boxes of model B, and 2 boxes of model C. A station wagon holds 1 box of model A, 3 boxes of model B, and 1 box of model C. If 15 boxes of model A, 20 boxes of model B and 22 boxes of model C are to be delivered, how many vehicles of each type should be used so that all operate at full capacity?

VIII. EVALUATION:

Methods/Frequency

A. Exams/Tests
Minimum of three examinations plus the final

B. Quizzes
Number of quizzes (announced or unannounced, in-class or take-home) at the discretion of the instructor

C. Projects
At the discretion of the instructor

D. Home Work
Assigned for each section covered

E. Lab Activities
Recommend a minimum of eight laboratory assignments over the semester

F. Other
1. Collaborative group activities or labs - at the discretion of the instructor
2. Presentations - at the discretion of the instructor

IX. TYPICAL TEXTS:

1. Lial, Margaret, Raymond Greenwell, and Nathan Ritchey. *Finite Mathematics.* 11th ed., Pearson, 2015.
2. Tan, Soo. *Finite Mathematics for the Managerial, Life, and Social Sciences.* 12th ed., CENGAGE Learning: Thomson-Brooks/Cole, 2018.
3. Goldstein, Larry, David Scneider, Martha Siegel, and Steven Hair. *Finite Mathematics and Its Applications.* 12th ed., Pearson Higher Education, Inc., 2017.

X. OTHER MATERIALS REQUIRED OF STUDENTS:

A. Graphing calculator with matrix operations and combinatorial functions

B. Optional: internet-based software may be required for some sections of the following courses. The online software includes an e-book and supplemental supports (such as videos, examples, online homework with immediate feedback, etc.) to support student mastery of the concepts.