MATH 101: Foundations of Algebra and Mathematical Modeling

Instructor: Kristen Henderson  
Office: 317 Fenton  
Class Time: MTWF 1:00-1:50 pm  
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Classroom: 307 DEA  
Email: khender3@uoregon.edu  
Office Hours: MW 10-11, TF 12-1 or by appointment

Prerequisites: Having taken the Math Placement Exam

Text and Required Materials:
(1) Class Notes (on Canvas)  
(2) Foundations of Mathematical Modeling, University of Oregon (on Canvas)  
(3) ALEKS access code (on Canvas)  
(4) A Scientific, NON-Graphing Calculator  
(5) Writing utensils to complete in-class assignments.

Course Description: Critical elements of pre-college algebra, topics including equation solving; rational, radical, exponential, and polynomial expression evaluation and simplification; lines, linear equations, quadratic equations, and exponential equations. Focus on mathematical modeling and preparation for additional college level mathematics.

Learning Objectives: A successful student should be able to succeed at an exam which focuses on the major objectives and contains a lesser focus on supporting objectives (in particular, drawing upon these for applied exercises).

Major Objectives — These objectives are priority targets on each summative exam subsequent to the introduction of that material. They include that a successful student can...

(1) simplify and evaluate algebraic expressions  
(2) solve and simplify linear equations in one or two variables  
(3) interpret a point on a graph (esp. a line) in the context of a word problem  
(4) interpret constants in the equation of a line in the context of a word problem  
(5) graph linear equations in two variables  
(6) determine the intercepts of a given line whether from a graph, table, or equation  
(7) solve systems of equations  
(8) set up and solve a variety of real-world problems based on exponential equations, linear equations or systems of equations (using substitution)  
(9) manipulate exponential expressions
(10) solve quadratic equations of the form $x^2 + bx + c = 0$ and $a(x - h)^2 + k = 0$ exactly

(11) solve word problems involving quadratic equations

(12) determine from a table, graph, or equation whether or not a relationship between between two variables is linear, exponential, or quadratic

(13) write an equation defining a relationship between variables in a piecewise manner

(14) interpret the result of mathematical processes in a non-mathematical context

(15) express written descriptions between variables as the graph, table, or formula for that relationship.

(16) estimate trend lines for linear, exponential, and quadratic regression. Interpret the residual at a given point.

(17) successfully use technology such as Excel, Google Sheets, Desmos, and/or WolframAlpha in application to the objectives

**Supporting Objectives** – These objectives may be present on individual assessments, but may not be included in all summative exams. They include that a successful student can...

(1) factor quadratic and other polynomial equations using the greatest common factor and difference of squares methods

(2) identify solutions to systems of equation as either a line, a point, or no intersection (parallel lines)

(3) perform operations involving polynomial and “linear-over-linear” rational expressions

(4) solve equations containing “linear-over-linear” rational expressions.

(5) simplify and perform operations involving radicals and polynomials

(6) solve systems of non-linear equations involving quadratic and linear equations

(7) solve absolute value equations of the form $|ax + b| = c$

(8) apply the rule of functions including accurately applying function notation of the form $f(a) = b$ for given values of $a$ and $b$ (not symbolic manipulation)

(9) identify the vertex and intercepts of a quadratic function (in vertex form or standard form)

(10) Create tables and interpret points from multilinear equations such as $z = 0.2x + 3y + 4$

**Prerequisite Objectives** – The following learning objectives are prerequisite to the course and will be tested exclusively through adaptive homework or their inclusion as part of another objective listed above. These prerequisite objectives include the ability to...

(1) accurately use the order of operations in order to reduce an expression, including those with absolute values, signed numbers, fractions, and/or decimals.

(2) add, subtract, multiply, and divide fractions and decimals

(3) explain when and why to use common denominators when performing operations on fractions

(4) identify whether a number is a whole number, an integer, or a real number
(5) accurately and efficiently perform calculations with real numbers including fractions, decimals, signed numbers, absolute value, etc.

Classroom Policy, Procedure, and Expectations: Students are expected to take responsibility for their own learning and progress. In general, this includes being aware of university policies and deadlines as well as specific policies, due dates, and exam dates.

Attendance: Attendance is integral to succeeding in this class. Part of each student’s grade is based on attendance and participation.

Participation: Students are expected to participate fully in the learning process. This includes completing any reading or other work required for each class before coming to class. During class, students are expected to participate in given activities, as well as to foster a positive and safe atmosphere for experimentation and learning.

Workload: In total, students will spend an average of 8 hours per week on assignments and study outside of class, in addition to the 4 weekly class meeting hours.

Adaptive Homework: Homework in the ALEKS adaptive online system will be regularly completed by students. ALEKS assignments will be due every Friday at 11:59 pm. The adaptive homework system will allow students to focus on the areas where they are struggling, and the software will provide assistance in these areas. Students enrolling in MATH 100 will have already taken the Math Placement Exam, and the assessment information from that exam will serve as the starting point for their ALEKS homework.

The link to buy, as well as access, ALEKS is on the class Canvas website.

In-Class Activities: Students will complete in-class activities at least once per week. It is extremely important to come to class prepared for these activities and to participate fully in your groups. Students are responsible for completing all activities and turning them in on the designated day.

Projects: Two multi-page written assignments will assigned, see tentative schedule. These projects will take a significant amount of time and should be started early. Projects should show effort and organization.

Quizzes: There will be a quiz each week, generally on Fridays. Quizzes will cover the concepts covered that week, both in-class and on ALEKS.

Exams: There are two midterms and a final exam in this class, see tentative schedule. Students are not allowed to use calculators, books, notes, or any outside assistance on exams. Exams will cover both in-class and ALEKS material.
Assessment and Grades:

Adaptive Homework 15%
Projects 10%
In-Class Activities/Quizzes 15%
Midterms 30%
Final Exam 30%

Grades are assigned according to the scale

A 90–100%
B 80–89%
C 70–79%
D 60–69%
F < 60%

Plus and minus grades are awarded to the top and bottom 2 percentage points in each grade bracket (so 98–100 is A+ and 90–92 is A-).

IMPORTANT NOTE! In order to pass this class, students must meet two requirements:

• An overall passing grade.
• A grade of at least 85% on the adaptive homework.

If you do not meet these two requirements, the highest grade you can get is a D+.

Tentative Weekly Schedule: The following is a non-binding notion of where we will be and what we will do each week. The actual assignment deadlines will be provided in class and usually also on Canvas.

Note: For space consideration, the abbreviation “AHW” means “Adaptive Homework”.

<table>
<thead>
<tr>
<th>Week</th>
<th>Class Time Agenda</th>
<th>Assignments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Linear equations of the form $y = mx$</td>
<td>AHW #1 due</td>
</tr>
<tr>
<td>2</td>
<td>Linear equations, Piece Wise Equations</td>
<td>AHW #2 due</td>
</tr>
<tr>
<td>3</td>
<td>Function Notation, Linear Regression</td>
<td>AHW #3 due</td>
</tr>
<tr>
<td>4</td>
<td>Average Cost, Review</td>
<td>AHW #4, Project #1 due</td>
</tr>
<tr>
<td>5</td>
<td>Systems of Linear Equations, Exponential</td>
<td>AHW #5 due, Exam #1</td>
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<tr>
<td>6</td>
<td>Exponential Equations and Regression</td>
<td>AHW #6 due;</td>
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<tr>
<td>7</td>
<td>Catch-up, Review, Linear vs. Exponential</td>
<td>AHW #7 due; Exam #2</td>
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<tr>
<td>8</td>
<td>Quadratic Functions</td>
<td>AHW #8 due</td>
</tr>
<tr>
<td>9</td>
<td>More Quadratics, Comparing Functions</td>
<td>Project #2 due</td>
</tr>
<tr>
<td>10</td>
<td>Catch-up, Review</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Final Exam PUT DATE/TIME HERE</td>
<td></td>
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Learning Environment: The University of Oregon strives for inclusive learning environments. Please notify me if the instruction or design of this course results in disability-related barriers to your participation. You are also encouraged to contact the Accessible Education Center in 164 Oregon Hall at 541-346-1155 or uoaec@uoregon.edu.

Resources Free tutoring is available on the fourth floor of the Knight library, as well as in the Math library on the second floor of Fenton Hall. Class Encore assistants will hold office hours that all Math 101 students are welcome to attend. Students may drop in to their instructor’s office hours without an appointment to ask questions.

Academic Conduct: The code of student conduct and community standards is at dos.uoregon.edu/conduct. In this course, it is appropriate to help each other on homework as long as the work you are submitting is your own and you understand it. It is not appropriate to help each other on exams, to look at other students exams, or to bring unauthorized material to exams.