MATH 021

College Algebra I

Sample Syllabus

Description

An extensive look into Quadratic equations; equations in quadratic form; word problems, graphing; algebraic fractions; negative and rational exponents, and radicals.

Prerequisite

Math 4 or satisfactory performance on the mathematics proficiency examination. Students who do not meet the prerequisite may have great difficulty in the course.

Objectives

Unit 0 is designed to ascertain prerequisite knowledge and skills which will facilitate success in this class. Students are expected to know and/or review and master most of these review topics on ALEKS within the first week of the class. Some of the topics are reviewed as needed in subsequent units.

- Simplify numerical expressions.
- Perform arithmetic operations with real numbers.
- Apply properties of real numbers to simplify expressions.
- Evaluate basic exponential expressions.
- Simplify and evaluate basic algebraic expressions.
- Solve first-degree equations.
- Use equations to solve word problems.
- Solve equations involving fractions or decimals.
- Solve basic word problems involving discounts and selling price, simple interest, and mixtures.
- Solve inequalities, and write solution sets in interval notation.
- Solve inequalities involving fractions or decimals.
- Solve compound inequalities.
- Use inequalities to solve word problems.

- Solve equations and inequalities that involve absolute value.
- Find and graph solutions for linear equations in two variables.
- Graph linear equations by finding the x and y intercepts.
- Graph lines passing through the origin, vertical lines, and horizontal lines.
- Use the distance formula.
- Determine the slope of a line, and use slope to graph lines.
- Determine the point-slope equation of a line.
- Determine the slope-intercept equation of a line.
- Find equations for parallel or perpendicular lines.
- Add, subtract, and multiply polynomials.
- Divide monomials.
- Factor out the greatest common factor.
- Factor by grouping.
- Factor the difference of two squares and the sum or difference of two cubes.
- Factor trinomials by trial-and-error and the four-step method.
- Solve polynomial equations by factoring.
- Solve systems of linear equations by graphing and substitution

Unit 1 contains review topics, however some of the topics may extend ideas which may be new to students. Upon successfully completing this unit, the student should be able to:

- Determine and interpret the slope of a line as a rate of change from: a table, a set of ordered points, an equation or a graph.
- Determine and utilize the point-slope equation of a line.
- Determine and utilize the slope-intercept equation of a line.
- Determine if two given lines are perpendicular or parallel.
- Write linear equations and graph lines that are parallel and perpendicular to a given line and passing through a given point.
- Apply The Pythagorean Formula to create and use the distance formula to find and interpret the distance between any two points on a line.
- Use the midpoint formula.
- Identify linear, quadratic, cubic, square root and absolute value functions from algebraic, graphical, tabular and verbal representations.
- Use function notation and piecewise defined function notation when evaluating polynomial and absolute value functions respectively.

- Determine the solution set for linear inequalities and graph the solution set on a number line.
- Determine the solution set for absolute value equations and inequalities and graph the solution set on a number line.
- Translate applications into algebraic models (equations and inequalities) involving linear and absolute value functions.
- Determine and interpret the solution sets for applications modeled by linear and absolute value equations and inequalities.
- Understand and utilize set notation and interval notation to describe, interpret and plot intervals and discrete points on a number line.
- Solve a system of two linear equations in two variables by substitution, graphing or elimination.
- Solve a system of three linear equations in three variables by elimination.
- Model applications which may be represented by a system of 2 linear equations and determine the solution set of the resulting system.

Unit 2 consists of topics associated with polynomial and rational expressions and functions. Upon successfully completing this unit, the student should be able to:

- Solve literal equations (solve for one variable in terms of another).
- Factor basic algebraic expressions (GCF and polynomial factoring).
- Simplify rational expressions.
- Add, subtract, multiply, and divide rational expressions.
- Simplify complex fractions.
- Identify Polynomial and Rational functions from algebraic, graphical, tabular and verbal representations.
- Determine the solution set for polynomial and rational equations.
- Translate applications into algebraic models involving polynomial and rational functions.
- Determine and interpret the solution sets for applications modeled by polynomial and rational functions.
- Determine the solution sets of polynomial and rational inequalities.
- Identify graphs and develop graphs for basic polynomial and rational functions by utilizing symmetry, intercepts, and translation techniques.

Unit 3 consists of topics associated with radical expressions and functions. Upon successfully completing this unit, the student should be able to:

- Identify Radical functions from algebraic and graphical representations.
- Convert from radical notation to rational exponent notation and from exponent notation to radical notation.
- Simplify radical expressions.
- Add, subtract, multiply, and divide radical expressions.
- Simplify radical expressions in terms of i.
- Add, subtract, multiply, and divide complex numbers and write solutions in standard form.
- Determine and verify solution sets of radical equations.
- Translate applications into algebraic models involving radical functions.
- Determine, verify, and interpret the solution sets for applications modeled by radical functions.
- Identify graphs and develop graphs for basic radical functions by plotting points and utilizing translation techniques.

Unit 4 consists of topics associated with quadratic equations and inequalities, quadratic models, parabolas, circles and applications of the midpoint and distance formulas. Upon successfully completing this unit, the student should be able to:

- Determine the solution set of quadratic equations by factoring, using the square root property, completing the square, and the quadratic formula.
- Determine the number and type of solutions to a quadratic equation using the discriminant.
- Given a quadratic function, write in standard form, identify the vertex and whether the vertex represents a maximum or minimum value.
- Write the quadratic function which represents a given graph of a parabola.
- Graph parabolas utilizing the vertex, symmetry, intercepts, end-behavior and translation techniques.
- Translate applications into algebraic models involving quadratic functions.
- Determine and interpret the solution sets for applications modeled by quadratic functions.

- Apply the distance formula and the midpoint formula to geometric applications.
- Interpret the description or graph of a circle to identify the center and the radius and write the equation of the circle in standard form.
- Convert a non-standard equation of a circle to standard form by completing the square and identify the center and radius.
- Graph circles from equations using the center and radius.

Materials

One-semester subscription access to ALEKS and the electronic copy of "Intermediate Algebra, 4th edition" published by McGraw-Hill, 2013. Authors: Julie Miller, Molly O'Neill, and Nancy Hyde. Access to ALEKS combined with access to the eBook can be purchased through ALEKS (www.aleks.com) using the course code and instructions found in the Orientation materials. The price is approximately $85. This option is much less expensive than buying the book and the code separately.

Textbook (Optional)

If you would like a hard copy of the text, you may purchase the text from an online text vendor of your choice. The ISBN is 9780073384498.

Course Schedule

Unit	Topic(s)
0	Review and Readiness
1	Solving Linear Equations and Linear Systems
2	Polynomial and Rational Expressions
3	Radical Expressions and Complex Numbers
4	Quadratic Equations, Functions, and Inequalities and Circles

Algebraic Skills

Algebraic skills will be primarily developed through work on ALEKS. ALEKS is a web-based tutorial system which provides students with ongoing skills based assessments and tracks progress. The midterm and final exams will also entail skills based problems.

As necessary, lectures will be done via BlackBoard Collaborate. The midterm and final exams will administered via Canvas.

ALEKS

Essentially all of the skills based work will be conducted through ALEKS. The ALEKS system will do ongoing assessments of skills based problems and track student progress. ALEKS is a major component of the course and a typical college algebra student will need to plan on 5-8 hours of online work each week (60-90 hours for the course). Skills based points will be earned by measuring mastered objective milestones and skills based ALEKS quizzes.

Canvas

The course management system is Canvas. Canvas will be used to deliver, the midterm exam and the final exam and associated practice/study exams.

PIAZZA & BlackBoard Collaborate

Participation in the course is gauged via a student's interaction on Piazza and live sessions. Students are expected to ask questions, pose problems and answer questions via the Piazza bulletin board.

Grading

The total number of points for the course will be 600 points. Work completed in ALEKS, which builds skills, will be worth 230 points. Participation points for active participation on the Piazza bulletin board and BlackBoard Live sessions is worth 20 points. The last component of the course consists of two (2) proctored exams, a midterm exam (150 points) and a comprehensive final exam (200 points). The final grade will be determined by the sum of these four areas.

PIAZZA & BlackBoard	ALEKS	CANVAS Exams
4 Participation Discussions (5 pts / each)	Readiness Assessment (10 pts)	Midterm Exam (150 pts)
	4 ALEKS Quizzes (40 pts / each)	Final Exam (200 pts)
	6 Unit Reviews (10 pts / each)	
20 pts	230 pts	350 pts

Grading Scale

Letter Grade	% Score	Total Points
A	90-100	537-600
B	80-89	477-536
C	70-79	417-476
D	60-69	357-416
F	0-59	0-356

Academic Integrity

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Academic integrity includes a commitment by all members of the University community not to engage in or tolerate acts of falsification, misrepresentation or deception. Such acts of dishonesty violate the fundamental ethical principles of the University community and compromise the worth of work completed by others.

Accommodating Disabilities

Penn State welcomes students with disabilities into the University's educational programs. Every Penn State campus has an office for students with disabilities. The Student Disability Resources (SDR) website provides contact information for every Penn State campus . For further information, please visit Student Disability Resources website.

In order to receive consideration for reasonable accommodations, you must contact the appropriate disability services office at the campus where you are officially enrolled, participate in an intake interview, and provide documentation: See documentation guidelines . If the documentation supports your request for reasonable accommodations, your campus disability services office will provide you with an accommodation letter. Please share this letter with your instructors and discuss the accommodations with them as early as possible. You must follow this process for every semester that you request accommodations.

Counseling and Psychological Services

Many students at Penn State face personal challenges or have psychological needs that may interfere with their academic progress, social development, or emotional wellbeing. The university offers a variety of confidential services to help you through difficult times, including individual and group counseling, crisis intervention, consultations, online chats, and mental health screenings. These services are provided by staff who welcome all students and embrace a philosophy respectful of clients' cultural and religious backgrounds, and sensitive to differences in race, ability, gender identity and sexual orientation.

- Counseling and Psychological Services at University Park (CAPS): 814-863-0395
- Counseling and Psychological Services at Commonwealth Campuses

- Penn State Crisis Line (Available 24 hrs, 7 days a week): 877-229-6400
- Crisis Text Line (Available 24 hrs, 7 days a week): Text LIONS to 741741

Educational Equity / Report Bias

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