

Syllabus

Course description: The goal of the course is to build an algebraic foundation for pre-calculus/calculus study. We will learn how to solve linear and quadratic equations, draw graphs of linear and quadratic functions, solve linear systems in two variables, solve linear and quadratic inequalities. We will discuss exponents, polynomials, radicals, and rational expressions.

Note: This course is not for credit and does not count towards one's cumulative GPA, but the grade does appear on one's transcript, counts towards the semester GPA, and counts towards credit enrollment. It is necessary to pass this course with a grade of C or better to move onto MAT 118, 122, 123 or AMS 101 (you may also enter AMS 101 with a 2+ on the placement exam, but admittance into other courses mentioned requires a 3 or a passing grade in MAP 103). This course does NOT satisfy the DEC C requirement but does satisfy the S1 skills requirement.

Learning activities:

- Watching prerecorded video lectures (handouts are provided) at <http://www.math.stonybrook.edu/Videos/courses/?open=MAP102>
- In-person lectures (masks on)
- Two evening Zoom meetings on Thursday 9/30 and Thursday 11/4 at 8:15pm-9:35pm.
- Office hours of instructors
- Assessments: homework (through WebAssign), in-class quizzes, two midterm exams, final exam.

Blackboard is the main resource to get the information about course materials, grades, announcements, contacts, due dates, etc. Check it regularly.

Textbook: Lynn Marecek, *Intermediate Algebra*, OpenStax.

The book is available for free at

<https://openstax.org/details/books/intermediate-algebra>

The book is also available as e-book through WebAssign.

WebAssign is the course home work platform and you need to purchase an access code (the first two weeks are free). You can access WebAssign through Blackboard.


WebAssign will be assigned one week before the due date. It is each student responsibility to submit all work **on time**.

Exams. You have to attend two midterms and the final exam. If you miss any of the exams without a legitimate and documented reason, you will automatically fail the course.

Midterms will be given **in class** on Weeks 7 and 12.

Final exam is on Tuesday, December 14th at 8:30pm-11:00pm. The location will be announced one week before the exam.

On each exam, you will get a paper with problems. You have to **write down** a complete solution of each problem. Answers alone will give **no** credit. Calculators, notes, textbooks, internet resources are **not** allowed on the exams.

 All your work should be done by you and nobody else. Submitting somebody's else work is a serious violation of university integrity policy and will be treated respectively. See Academic integrity statement below.

Grading System. The only basis for the grades of any student is academic performance of the student.

Midterm 1 25%
 Midterm 2 25%
 Final exam: 30%
 WebAssign (homework) 10%
 in-class quizzes 5%
 attendance 5%.

Make-up policy. Make-up examination will be given only for work missed due to unforeseen circumstances beyond the student's control. No make-ups are allowed if you miss an a exam without serious and **documented** reason.

Lowest grades for any type of work will not be dropped. Extra assignments to "boost" the grades will not be given. Make-ups for quizzes will not be given.

Math Learning Center (MLC) is a virtual place where you can get free tutoring help with any of your math concerns. No appointment is required. Visit MLC at

<http://www.math.stonybrook.edu/mlc/center-hours.html>

The Student Accessibility Support Center (SASC): If you have a physical, psychological, medical, or learning disability that may impact your course work, please contact The Student Accessibility Support Center (631) 6326748 or <http://studentaffairs.stonybrook.edu/dss/>. They will determine with you what accommodations are necessary and appropriate. All information and documentation is confidential. Students who require assistance during emergency evacuation are encouraged to discuss their needs with their professors and SASC. For procedures and information go to the following website:
www.stonybrook.edu/ehs/fire/disabilities/asp.

Academic integrity statement: Each student must pursue his or her academic goals honestly and be personally accountable for all submitted work. Representing another person's work as your own is always wrong. Faculty are required to report any suspected instance of academic dishonesty to the Academic Judiciary. For more comprehensive information on academic integrity, including categories of academic dishonesty, please refer to the academic judiciary website at www.stonybrook.edu/uaa/academicjudiciary

Critical incident management: Stony Brook University expects students to respect the rights, privileges, and property of other people. Faculty are required to report to the Office of Student Conduct and Community Standards any disruptive behavior that interrupts their ability to teach, compromises the safety of the learning environment, or inhibits students' ability to learn. Until/unless the latest COVID guidance is explicitly amended by SBU, during Fall 2021" disruptive behavior" will include refusal to wear a mask during classes.

For the latest COVID guidance, please refer to:

<https://www.stonybrook.edu/commcms/strongertogether/latest.php>

Weekly Plan (tentative)

Week 1 (August 23-27)

Video lectures: 1-6.

Sections in the textbook: 1.1, 1.2, 1.4, 1.5.

Learning objectives. Numbers and variables. Operations of addition and multiplication and their properties (commutativity, associativity and distributivity). Subtraction and division as operations opposite to addition and multiplication. Parentheses and order of operations. Algebraic expressions.

Learning outcomes. A student should be able to

1. distinguish integers, rational, irrational, and real numbers
2. represent real numbers as decimals and as points on the real line
3. identify a numerical expression and evaluate it
4. operate with numerical expressions containing multiple parentheses
5. explain what a variable is and what it is used for
6. identify an algebraic expression, comprehend it as an algorithm for calculations and explain why algebraic expressions are important
7. perform operations in correct order
8. evaluate an expression at a number
9. express symbolically the properties of commutativity and associativity of addition and multiplication
10. describe the numbers 0 and 1 by their properties
11. explain what the reciprocal of a number is
12. comprehend subtraction and division as operations opposite to addition and multiplication respectively
13. explain why division by 0 does not make sense
14. explain why subtraction and division are neither commutative nor associative
15. state the property of distributivity in general terms
16. use distributive property to clear parentheses in algebraic expressions
17. apply distributivity to factoring expressions
18. combine similar terms in algebraic expressions.

Week 2 (August 30-September 3)

Video lectures: 7-8.

Sections in the textbook: 5.2.

Learning objectives. Powers with integer exponents. Power rules.

Learning outcomes. A student should be able to

1. understand the meaning of a power of a variable
2. use exponential notation and terminology correctly
3. operate with negative base
4. explain the meaning of zero and negative exponent
5. list and prove the power rules: multiplication and division of powers with the same base, power of a power, multiplication and division of powers with the same exponent
6. fluently apply the power rules for operating with algebraic expressions.

Week 3 (September 6-10. No classes on Monday 9/6: Labor day)

Video lectures: 9-10.

Sections in the textbook: 5.1, 5.3, 6.2

Learning objectives. Polynomials and operations with them. Formulas to remember: short multiplication (the square of a sum/difference) and the difference of squares.

Learning outcomes. A student should be able to

1. identify a polynomial expression
2. understand what a monomial is
3. identify a polynomial in several variables
4. simplify polynomial expressions by clearing parentheses and combining similar terms
5. identify the standard form of a polynomial in one variable
6. identify the degree and the coefficients of a polynomial
7. bring a polynomial to the standard form
8. perform addition, subtraction and multiplication of polynomials
9. state and prove short multiplication formulas in general terms
10. state and prove difference of squares formula in general terms
11. apply the short multiplication and difference of squares formulas for expansion and factoring
12. evaluate a polynomial at a number
13. substitute an algebraic expression into a polynomial and simplify the result

Week 4 (September 13-17)

Video lectures: 11-13.

Sections in the textbook: 1.3, 2.2, 5.4, 6.1, 7.1, 7.2

Learning objectives. Fractions and operations with them (review). Rational expressions and operations with them. Composing algebraic expression after word description.

Learning outcomes. A student should be able to

1. understand what a fraction represents and perform operations with fractions
2. explain what a rational expression is
3. evaluate a rational expression at a number
4. substitute an algebraic expression into a rational expression
5. perform correctly cancellations in rational expressions
6. analyze typical mistakes in cancellations
7. use factoring for cancellations
8. state the rules for multiplying and dividing rational expressions and relate these rules to fraction multiplication and division
9. explain how to add and subtract rational expressions
10. perform multiplication, division, addition, and subtraction of rational expressions
11. translate English phrases into algebraic expressions
12. use schematic drawings for problem solving
13. use geometric formulas (perimeter, area, volume), physical formulas (uniform motion), and common facts about percentage and pricing in word problems
14. analyze the obtained result.

Week 5 (September 20-24)

Video lectures: 14-15.

Sections in the textbook: 2.1, 2.3.

Learning objectives. Notion of equation. Equivalent equations. Solution of an equation. Linear equations. Number of solutions of a linear equation.

Learning outcomes. A student should be able to

1. explain what an algebraic equality is
2. classify equalities with variables as identities, contradictions and equations
3. list some commonly used algebraic identities
4. prove algebraic identities
5. understand what an equation in one variable is and what its solution is
6. explain what it means to solve an equation
7. explain what does it mean that two equations are equivalent
8. describe and perform elementary transformations of an equation
9. explain what a linear equation is
10. present an algorithm for solving a linear equation
11. explain how many solutions a linear equation may have and why it is so
12. solve linear equations and verify whether a solution is correct.

Week 6 (September 27-October 1)

Video lecture: 16.

Section in the textbook: 2.4.

Learning objectives. Word problems leading to linear equations.

Learning outcomes. A student should be able to

1. solve linear equations originated in geometry and physics
2. adopt a general scheme for solving a word problem
3. understand how to choose a variable and compose an equation
3. apply appropriate formulas for problem solving.

Week 7 (October 4-8) Midterm 1 is on Monday or Tuesday

Video lecture: 18.

Sections in the textbook: 1.2, 2.5, 2.6, 2.7.

Learning objectives. Number line. Intervals. Absolute value of a real number. Linear equations involving absolute value.

Learning outcomes. A student should be able to

1. relate simplest inequalities and intervals on the number line
2. adopt the interval notations for intervals on the real line
3. comprehend the concept of absolute value of a number
4. interpret absolute value as a distance
5. interpret geometrically simplest equations involving absolute value
6. solve equations involving absolute value.

Week 8 (October 11-15. No classes October 11-12: Fall break)

Video lecture: 17.

Sections in the textbook:

Learning objectives. Linear inequalities. Equivalent inequalities. What is a solution of an inequality. Double inequalities and systems of inequalities.

Learning outcomes. A student should be able to

- 1 describe what a linear inequality is
2. explain what is the solution set of an inequality
3. describe the solution of an inequality in different ways: in interval notation, using set builder notation, and graphically on the number line
4. explain what it means that two inequalities are equivalent and what the elementary transformations of inequalities are
5. use the equivalence sign correctly
6. explain why multiplying both sides of the inequality by a negative number results in

reversing the sign of the inequality

7. solve linear inequalities by performing elementary transformations
8. write down the solution of a solved inequality in different ways: using inequality signs, as a set, and as an interval on the number line
9. solve a system of linear inequalities and give a geometric interpretation of the solution
10. interpret a double inequality as a system of inequalities and solve it.
11. interpret the absolute value of a number as a distance
12. comprehend the general formula defining the absolute value of a variable
13. state and explain the properties of absolute value
14. perform calculations involving absolute values
15. solve linear equations involving absolute value
16. solve linear inequalities involving absolute value

Week 9 (October 18-22)

Video lectures: 19-20.

Sections in the textbook: 3.1, 3.2, 3.3.

Learning objectives. Rectangular coordinate system. Linear equations in two variables. Graph of a linear equation. Lines on a plane. Intercepts, slope, vertical and horizontal lines. Various forms of a linear equation: standard, two intercept, slope-intercept, point-slope form, two-points form. Parallel and perpendicular lines.

Learning outcomes. A student should be able to

1. explain what a Cartesian coordinate system on a plane is
2. describe the points on Cartesian planes by their coordinates
3. recognize the equations of vertical and horizontal lines
4. present the general form of a linear equation in two variables and describe what a given linear equation represents geometrically
5. explain how to draw a straight line by its equation
6. understand what the intercepts of a line are and how to find their coordinates
7. present a line equation in two-intercept form
8. operate with linear equations in the slope-intercept form
9. provide algebraic and geometric description of the slope of a line
10. explain why parallel lines have the same slope
11. verify if two given equations represent parallel lines
12. write an equation of a line passing through two given points
13. use the point-slope form of the equation of a line
14. explain why perpendicular lines have negative reciprocal slopes.

Week 10 (October 25-29)

Video lectures: 21-23.

Sections in the textbook: 4.1-4.3, 4.7.

Learning objectives. Systems of two linear equations and their geometrical interpretation. Inconsistent and dependent systems. Word problems leading to systems of linear equations.

Learning outcomes. A student should be able to

1. explain what a linear system of two equations in two variables is
2. explain what it means to solve a system
3. give geometric description of a linear system and its solution
4. explain how many solutions a linear system may have
5. perform elementary transformations of a system
6. solve a system by substitution
7. solve a system by elimination
8. use combined methods for solving a system
9. check a solution of a system
10. write down the solution of a system with infinitely many solutions.
11. choose variables appropriately
12. compose a system of equations according to the text of the problem
13. solve the system
14. verify the solution.

Week 11 (November 1-5)

Video lecture: 24.

Sections in the textbook: 8.1, 8.2, 8.5.

Learning objectives. Notion of radical. Rules for radicals.

Learning outcomes. A student should be able to

1. know the definition of a principal square root of a non-negative number
2. use the radical sign correctly
3. identify perfect squares
4. comprehend taking the principal square root as an operation opposite to squaring
5. list the properties of radicals
6. explain how to calculate the radical of the square of a variable
7. be aware about typical misconceptions related to radicals
8. explain what is the simplest radical form and how to operate with radical expressions.

Week 12 (November 8-12) Midterm 2 is on Monday or Tuesday

Video lecture: 25.

Sections in the textbook: 8.3, 8.4, 8.6.

Learning objectives. Radicals as powers with rational exponents.

Learning outcomes. A student should be able to

1. define n th root of a number, in particular, third root and fourth root
2. operate with odd-ordered and even-ordered roots using their properties

3. understand the difference between odd-ordered and even-ordered roots
4. interpret n th root as a power with fractional exponent
5. operate with rational exponents.

Week 13 (November 15-19)

Video lectures: 26-29.

Sections in the textbook: 9.1, 9.2, 9.3, 9.4.

Learning objectives. Quadratic polynomials and quadratic equations. Quadratic formula. Factoring quadratic polynomials.

Learning outcomes. A student should be able to

1. identify the standard form of a quadratic polynomial
2. identify quadratic binomials and quadratic trinomials
3. identify quadratic equation
4. define the roots of a quadratic equation and a quadratic polynomial
5. solve binomial quadratic equations and present solution in simplest radical forms
6. solve binomial equations by factoring
7. remember the quadratic formula
8. perform completing the square
9. understand proving the quadratic formula
10. know what the discriminant is and how it affects the roots of the equation
11. apply quadratic formula for solving quadratic equations
12. solve quadratic equations which are not written in the standard form
13. choose the most optimal strategy for solving a quadratic equation
14. factor a quadratic binomial
15. factor a quadratic trinomial using the roots
16. state Vieta's theorem
17. apply Vieta's theorem for finding the roots
18. solve a quadratic equation by factoring

Week 14 (November 22-23. No classes November 24-26: Thanksgiving break)

Video lecture: 29.

Sections in the textbook: 9.5.

Learning objectives. Equations reducible to quadratic. Word problems leading to quadratic equations.

Learning outcomes. A student should be able to

1. solve polynomial equations reducible to quadratic
2. solve rational equations reducible to quadratic
3. solve word problems leading to quadratic equations and analyze the answer.

Week 15 (November 29-December 3)

Video lectures: 30-31.

Sections in the textbook: 9.6, 9.8.

Learning objectives. Quadratic functions and their graphs. Vertex, axis of symmetry, intercepts of a parabola. Quadratic inequalities.

Learning outcomes. A student should be able to

1. identify a quadratic function
2. comprehend a parabola as the graph of a quadratic function
3. identify geometric properties of a parabola and relate them to the algebraic formula defining the parabola
4. identify on the graph the vertex, axis of symmetry, x - and y -intercepts of the parabola
5. know the formula for the vertex and axis of symmetry of a parabola
6. draw the parabola from its equation by identifying its essential geometric elements
7. identify a quadratic inequality
8. interpret a quadratic inequality geometrically
9. solve quadratic inequalities using the roots
10. write down the solution of a quadratic inequality using interval notation.

Week 16 (Monday, December 6 is the last day of classes)

Review for the Final exam.

Final exam (Tuesday, December 14th at 8:30pm-11:00pm)