

Course Syllabus

QUANTITATIVE REASONING II (Math 111)

- Description:** *A second course to assist students in developing fundamental mathematical concepts and processes. Coursework is a combination of (1) in-class collaborative problem solving and algebraic skill building with an emphasis on reasoning and communication, and (2) an on-line component presenting tutorials in, and aiming for mastery of, skill-based algebraic content within the realm of College Algebra. This course may not be used to fulfill the General Education Requirement in the College of Arts and Sciences nor be counted toward a major or minor in mathematics. Prerequisite: Grade of C- or higher in MATH 110 or placement higher than MATH 110 in the Math Placement process.*
- Credit Hours:** 2 Cr.
- Audience:** Students may be recommended to take this course based on the Math Placement process, or may progress to this course out of Math 110. This course, or placement higher, is a pre-requisite for Math 124: Finite Mathematics and Math 115: Trigonometry and Functions.
- Prerequisites:** Grade of C- or higher in Math 110 or placement higher than Math 110 in the Math Placement process. A grade of C- or higher in this class is required for progress to Math 115: Trigonometry and Functions.
- Format:** 200 minutes in class per week plus out of class work on-line. The course is available in both the first and second seven week terms of the Fall and Spring semesters. Summer offerings may be available when there is sufficient demand.
- Text / Software:** ALEKS Access Code (18 weeks) for *College Algebra and Trigonometry, 1st Ed*, by Miller and Gerkin (McGraw Hill, ISBN 9781259739323). This on-line platform will be used throughout. Students are encouraged to bring their own devices (tablets, laptops) to class; a small number of extras will be available during class periods.
- Internet:** Blackboard may be used by course instructors.
- Ability-Related Support:** The Access & Accommodations Resource Center (AARC) is the campus office that works with students to provide access and accommodations in cases of diagnosed mental or emotional health issues, attentional or learning disabilities, vision or hearing limitations, chronic diseases, or allergies. You can contact the office at aarc@valpo.edu or 219.464.5206. Students who need, or think they may need, accommodations due to a diagnosis, or who think they have a diagnosis, are invited to contact AARC to arrange a confidential discussion with the AARC office. Further, students who are registered with AARC are required to contact their professor(s) if they wish to exercise the accommodations outlined in their letter from the AARC.
- Notice of Cancellation:** In the event class is cancelled, you will be notified through your Valparaiso University e-mail account.

Student Learning Objectives:

Students will:

- A. Demonstrate mastery of a range of algebraic topics in the realm of College Algebra.
- B. Demonstrate college-ready organizational, problem-solving, and mathematical communication skills.
- C. Demonstrate college-ready ability to work in groups and interact in peer-to-peer communication

Topics Include:

See attached detailed (representative) syllabus from ALEKS 360.

ALEKS[®] Course Syllabus

Course Name: MATH 111 F2B: Quantitative Reasoning II - 10:30am - 12:30pm	Course Code: UWUMF-PQXDF
ALEKS Course: College Algebra with Trigonometry	Instructor: Luther
Course Dates: Begin: 10/09/2017 End: 02/23/2018	Course Content: 207 topics / 138 accessible topics
Textbook: Miller: College Algebra & Trigonometry, 1st Ed. (McGraw-Hill) - ALEKS 360	

 Accessible Topic - Topics accessible to visually impaired students using a screen reader.

Course Readiness and Chapter R - Review of Prerequisites (37 topics, no due date)

Course Readiness (1 topic)

- Graphing a compound inequality on the number line

Section R.1 (6 topics)

- Exponents and signed fractions 
- Order of operations with integers 
- Order of operations with integers and exponents 
- Cube root of an integer 
- Translating a sentence into a one-step equation 
- Translating a sentence into a multi-step equation 

Section R.2 (3 topics)

- Product rule with positive exponents: Univariate 
- Power rules with positive exponents: Multivariate products 
- Simplifying a ratio of multivariate monomials: Advanced 

Section R.3 (3 topics)

- Simplifying a higher root of a whole number 
- Square root multiplication: Basic 
- Square root of a rational perfect square 

Section R.4 (7 topics)

- Simplifying a sum or difference of two univariate polynomials 
- Multiplying a univariate polynomial by a monomial with a positive coefficient 
- Multiplying binomials with leading coefficients greater than 1 
- Multiplying binomials in two variables 
- Multiplying conjugate binomials: Univariate 
- Squaring a binomial: Univariate 
- Multiplying binomials with negative coefficients 

Section R.5 (8 topics)

- Greatest common factor of 2 numbers 
- Factoring a linear binomial 
- Factoring out a monomial from a polynomial: Univariate 
- Factoring a quadratic with leading coefficient 1 
- Factoring out a constant before factoring a quadratic 
- Factoring a quadratic with leading coefficient greater than 1: Problem type 1 
- Factoring a quadratic with a negative leading coefficient 
- Factoring a difference of squares in one variable: Basic 

Section R.6 (9 topics)

- Restriction on a variable in a denominator: Linear [↗](#)
- Simplifying a ratio of factored polynomials: Linear factors [↗](#)
- Simplifying a ratio of polynomials using GCF factoring [↗](#)
- Simplifying a ratio of polynomials by factoring a quadratic with leading coefficient 1 [↗](#)
- Multiplying rational expressions made up of linear expressions [↗](#)
- Least common multiple of 2 numbers [↗](#)
- Finding the LCD of rational expressions with linear denominators: Relatively prime [↗](#)
- Finding the LCD of rational expressions with linear denominators: Common factors [↗](#)
- Complex fraction without variables: Problem type 1 [↗](#)

Chapter 1 - Equations and Inequalities (48 topics, no due date)

Section 1.1 (14 topics)

- Additive property of equality with signed fractions [↗](#)
- Multiplicative property of equality with signed fractions [↗](#)
- Solving a multi-step equation given in fractional form [↗](#)
- Solving a linear equation with several occurrences of the variable: Variables on both sides and distribution [↗](#)
- Solving equations with zero, one, or infinitely many solutions [↗](#)
- Solving a proportion of the form $(x+a)/b = c/d$ [↗](#)
- Solving for a variable in terms of other variables using addition or subtraction: Advanced [↗](#)
- Solving for a variable in terms of other variables using multiplication or division: Advanced [↗](#)
- Solving for a variable in terms of other variables in a linear equation with fractions [↗](#)
- Solving a rational equation that simplifies to linear: Denominator $x+a$ [↗](#)
- Solving a rational equation that simplifies to linear: Denominators a , x , or ax [↗](#)
- Solving for a variable in terms of other variables in a rational equation: Problem type 2 [↗](#)
- Restriction on a variable in a denominator: Quadratic [↗](#)
- Solving a rational equation that simplifies to linear: Factorable quadratic denominator [↗](#)

Section 1.2 (4 topics)

- Writing a multi-step equation for a real-world situation [↗](#)
- Solving a distance, rate, time problem using a linear equation [↗](#)
- Finding the sale price given the original price and percent discount [↗](#)
- Word problem on proportions: Problem type 1 [↗](#)

Section 1.3 (2 topics)

- Using i to rewrite square roots of negative numbers [↗](#)
- Adding or subtracting complex numbers [↗](#)

Section 1.4 (10 topics)

- Pythagorean Theorem [↗](#)
- Word problem involving the Pythagorean Theorem [↗](#)
- Solving an equation written in factored form [↗](#)
- Finding the roots of a quadratic equation of the form $ax^2 + bx = 0$ [↗](#)
- Finding the roots of a quadratic equation with leading coefficient 1 [↗](#)
- Solving a quadratic equation needing simplification [↗](#)
- Solving an equation of the form $x^2 = a$ using the square root property [↗](#)
- Completing the square [↗](#)
- Solving a quadratic equation by completing the square: Exact answers [↗](#)
- Applying the quadratic formula: Exact answers [↗](#)

Section 1.5 (2 topics)

- Solving a word problem using a quadratic equation with rational roots [↗](#)
- Using the Pythagorean Theorem and a quadratic equation to find side lengths of a right triangle [↗](#)

Section 1.6 (8 topics)

- Word problem involving multiple rates [↗](#)
- Solving a rational equation that simplifies to quadratic: Denominator x [↗](#)
- Algebraic symbol manipulation with radicals [↗](#)
- Solving an equation with a root index greater than 2: Problem type 1 [↗](#)
- Solving an equation with exponent $1/a$: Problem type 1 [↗](#)
- Solving an equation that can be written in quadratic form: Problem type 1 [↗](#)
- Solving an absolute value equation: Problem type 4 [↗](#)
- Solving an absolute value equation of the form $|ax+b| = |cx+d|$ [↗](#)

Section 1.7 (8 topics)

- Finding the value for a new score that will yield a given mean 
- Translating a sentence into a multi-step inequality 
- Translating a sentence into a compound inequality 
- Graphing a compound inequality on the number line
- Solving a two-step linear inequality: Problem type 2 
- Solving a compound linear inequality: Graph solution, basic
- Solving a compound linear inequality: Interval notation 
- Solving an absolute value inequality: Problem type 4

Chapter 2 - Functions and Relations (56 topics, no due date)

Section 2.1 (5 topics)

- Plotting a point in the coordinate plane
- Finding x- and y-intercepts of the graph of a nonlinear equation 
- Distance between two points in the plane: Exact answers 
- Midpoint of a line segment in the plane 
- Naming the quadrant or axis of a point given the signs of its coordinates 

Section 2.2 (3 topics)

- Writing an equation of a circle given its center and a point on the circle 
- Writing an equation of a circle given its center and radius or diameter 
- Identifying the center and radius to graph a circle given its equation in standard form

Section 2.3 (9 topics)

- Finding x- and y-intercepts given the graph of a line on a grid
- Vertical line test
- Evaluating functions: Linear and quadratic or cubic 
- Evaluating functions: Absolute value, rational, radical 
- Domain of a rational function: Excluded values 
- Domain of a square root function: Basic 
- Finding the domain of a fractional function involving radicals 
- Domain and range from the graph of a continuous function
- Domain and range from the graph of a piecewise function

Section 2.4 (9 topics)

- Graphing a linear equation of the form $y = mx$
- Graphing a line given its equation in slope-intercept form: Fractional slope
- Graphing a line given its equation in standard form
- Graphing a vertical or horizontal line
- Finding x- and y-intercepts of a line given the equation: Basic 
- Finding slope given two points on the line 
- Finding the slope of horizontal and vertical lines 
- Graphing a line given its slope and y-intercept
- Graphing a line through a given point with a given slope

Section 2.5 (5 topics)

- Writing an equation in point-slope form given the slope and a point 
- Writing an equation of a line given the y-intercept and another point
- Finding slopes of lines parallel and perpendicular to a line given in slope-intercept form 
- Scatter plots and correlation
- Classifying linear and nonlinear relationships from scatter plots

Section 2.6 (15 topics)

- Graphing an absolute value equation of the form $y = A|x|$
- Graphing a parabola of the form $y = ax^2$
- Graphing a parabola of the form $y = ax^2 + c$
- Graphing a cubic function of the form $y = ax^3$
- Graphing an absolute value equation in the plane: Basic
- Graphing a function of the form $f(x) = ax^2$
- Graphing a function of the form $f(x) = ax^2 + c$
- Graphing a parabola of the form $y = (x-h)^2 + k$

- Graphing a square root function: Problem type 1
- Graphing a cube root function
- Translating the graph of an absolute value function: Two steps
- Transforming the graph of a function by shrinking or stretching
- Transforming the graph of a quadratic, cubic, square root, or absolute value function
- Transforming the graph of a function by reflecting over an axis
- Transforming the graph of a function using more than one transformation

Section 2.7 (7 topics)

- Evaluating a piecewise-defined function 
- Finding where a function is increasing, decreasing, or constant given the graph
- Finding where a function is increasing, decreasing, or constant given the graph: Interval notation
- Finding local maxima and minima of a function given the graph
- Even and odd functions: Problem type 1
- Graphing a piecewise-defined function: Problem type 2
- Determining if graphs have symmetry with respect to the x-axis, y-axis, or origin

Section 2.8 (3 topics)

- Sum, difference, and product of two functions 
- Quotient of two functions: Basic 
- Composition of two functions: Basic 

Chapter 3 - Polynomial and Rational Functions (21 topics, no due date)

Section 3.1 (8 topics)

- Graphing a parabola of the form $y = (x-h)^2 + k$
- Finding the vertex, intercepts, and axis of symmetry from the graph of a parabola
- Graphing a parabola of the form $y = x^2 + bx + c$
- Finding the x-intercept(s) and the vertex of a parabola 
- Finding the maximum or minimum of a quadratic function 
- Word problem involving the maximum or minimum of a quadratic function 
- Range of a quadratic function 
- Rewriting a quadratic function to find its vertex and sketch its graph

Section 3.2 (1 topic)

- Determining the end behavior of the graph of a polynomial function 

Section 3.3 (3 topics)

- Polynomial long division: Problem type 1
- The Factor Theorem 
- Writing a quadratic function given its zeros 

Section 3.4 (2 topics)

- Descartes' Rule of Signs
- Multiplying expressions involving complex conjugates 

Section 3.5 (7 topics)

- Finding the asymptotes of a rational function: Constant over linear
- Graphing a rational function: Constant over linear
- Graphing a rational function: Linear over linear
- Graphing a rational function: Quadratic over linear
- Finding the asymptotes of a rational function: Quadratic over linear
- Graphing a rational function with more than one vertical asymptote
- Graphing rational functions with holes

Chapter 4 - Exponential and Logarithmic Functions (36 topics, no due date)

Section 4.1 (4 topics)

- Horizontal line test
- Determining whether two functions are inverses of each other 
- Inverse functions: Rational 
- Inverse functions: Cubic, cube root 

Section 4.2 (10 topics)

- Translating the graph of an exponential function
- The graph, domain, and range of an exponential function
- Graphing an exponential function and its asymptote: $f(x) = a(e)^{x-b} + c$
- Introduction to compound interest 
- Finding a final amount in a word problem on exponential growth or decay 
- Finding the final amount in a word problem on compound interest 
- Graphing an exponential function and its asymptote: $f(x)=b^x$
- Finding the final amount in a word problem on continuous compound interest 
- Graphing an exponential function and its asymptote: $f(x)=b^{-x}$ or $f(x)=-b^{ax}$
- Graphing an exponential function and its asymptote: $f(x) = a(b)^x$

Section 4.3 (6 topics)

- Translating the graph of a logarithmic function
- Graphing a logarithmic function: Basic
- The graph, domain, and range of a logarithmic function
- Converting between logarithmic and exponential equations 
- Evaluating logarithmic expressions 
- Converting between natural logarithmic and exponential equations 

Section 4.4 (4 topics)

- Basic properties of logarithms 
- Expanding a logarithmic expression: Problem type 1 
- Writing an expression as a single logarithm 
- Change of base for logarithms: Problem type 1 

Section 4.5 (8 topics)

- Solving an equation of the form $\log_b a = c$ 
- Solving a multi-step equation involving natural logarithms 
- Solving an equation involving logarithms on both sides: Problem type 1 
- Solving an exponential equation by finding common bases: Linear exponents 
- Solving an exponential equation by using logarithms: Decimal answers, basic 
- Using properties of logarithms to evaluate expressions 
- Solving a multi-step equation involving a single logarithm: Problem type 1 
- Graphically solving a system of linear equations

Section 4.6 (4 topics)

- Finding the initial amount and rate of change given an exponential function 
- Writing an equation that models exponential growth or decay 
- Finding the time given an exponential function with base e that models a real-world situation 
- Finding half-life or doubling time 

Chapter 9 - Systems of Equations and Inequalities (12 topics, no due date)

Section 9.1 (5 topics)

- Classifying systems of linear equations from graphs
- Solving a distance, rate, time problem using a system of linear equations 
- Graphically solving a system of linear equations
- Identifying solutions to a system of linear equations 
- Solving a word problem involving a sum and another basic relationship using a system of linear equations 

Section 9.2 (1 topic)

- Solving a 3x3 system of linear equations: Problem type 1 

Section 9.5 (4 topics)

- Solving a word problem using a system of linear inequalities: Problem type 1
- Graphing a linear inequality in the plane: Slope-intercept form
- Graphing a system of two linear inequalities: Basic
- Graphing a system of three linear inequalities

Section 9.6 (2 topics)

- Solving a word problem using linear programming
- Linear programming