

NOUVEL CATHOLIC CENTRAL HIGH SCHOOL

PRE-CALCULUS

COURSE SYLLABUS

2017-2018

COURSE DESCRIPTION:	<p>This one-year class is a continuation of Algebra II topics. It reviews and expands on the concepts of Algebra II in greater depth and difficulty including applications methods. New topics include vectors, polar coordinates, complex numbers, trigonometry, conics, exponential and logarithmic functions and an introduction to limits. The goals include: developing proficiency with mathematical skills, expanding understanding of mathematical concepts using the graphing calculator, and preparing students for an AP or college calculus course.</p> <p>Grades offered: 10, 11 and 12</p> <p>Prerequisite: Algebra II</p>
MAJOR COURSE GOALS:	<p>P1 Functions</p> <p>P1.1 Know and use a definition of a function to decide if a given relation is a function.</p> <p>P1.2 Perform algebraic operations (including compositions) on functions and apply transformations (translations, reflections, and rescalings).</p> <p>P1.3 Write an expression for the composition of one given function with another and find the domain, range, and graph of the composite function. Recognize components when a function is composed of two or more elementary functions.</p> <p>P1.4 Determine whether a function (given symbolically or graphically) has an inverse and express the inverse (symbolically, if the function is given symbolically, or graphically, if given graphically) if it exists. Know and interpret the function notation for inverses.</p> <p>P1.5 Determine whether two given functions are inverses, using composition.</p> <p>P1.6 Identify and describe discontinuities of a function (e.g., greatest integer function, $1/x$) and how these relate to the graph.</p> <p>P1.7 Understand the concept of limit of a function as x approaches a number or infinity. Use the idea of limit to analyze a graph as it</p>

approaches an asymptote. Compute limits of simple functions (e.g., find the limit as x approaches 0 of $f(x) = 1/x$) informally.

P1.8 Explain how the rates of change of functions in different families (e.g., linear functions, exponential functions, etc.) differ, referring to graphical representations.

P2 Exponential and Logarithmic Functions

P2.1 Use the inverse relationship between exponential and logarithmic functions to solve equations and problems.

P2.2 Graph logarithmic functions. Graph translations and reflections of these functions.

P2.3 Compare the large-scale behavior of exponential and logarithmic functions with different bases and recognize that different growth rates are visible in the graphs of the functions

P2.4 Solve exponential and logarithmic equations when possible, (e.g. $5x=3(x+1)$). For those that cannot be solved analytically, use graphical methods to find approximate solutions.

P2.5 Explain how the parameters of an exponential or logarithmic model relate to the data set or situation being modeled. Find an exponential or logarithmic function to model a given data set or situation. Solve problems involving exponential growth and decay.

P3 Quadratic Functions

P3.1 Solve quadratic-type equations (e.g. $e^{2x}-4e^x+4=0$) by substitution.

P3.2 Apply quadratic functions and their graphs in the context of motion under gravity and simple optimization problems.

P3.3 Explain how the parameters of an exponential or logarithmic model relate to the data set or situation being modeled. Find a quadratic function to model a given data set or situation.

P4 Polynomial Functions

P4.1 Given a polynomial function whose roots are known or can be calculated, find the intervals on which the function's values are positive and those where it is negative.

P4.2 Solve polynomial equations and inequalities of degree greater than or equal to three. Graph polynomial functions given in factored form using zeros and their multiplicities, testing the sign-

on intervals and analyzing the function's large-scale behavior.

P4.3 Know and apply fundamental facts about polynomials: the Remainder Theorem, the Factor Theorem, and the Fundamental Theorem of Algebra.

P5 Rational Functions and Difference Quotients

P5.1 Solve equations and inequalities involving rational functions. Graph rational functions given in factored form using zeros, identifying asymptotes, analyzing their behavior for large x values, and testing intervals.

P5.2 Given vertical and horizontal asymptotes, find an expression for a rational function with these features.

P5.3 Know and apply the definition and geometric interpretation of difference quotient. Simplify difference quotients and interpret difference quotients as rates of change and slopes of secant lines.

P6 Trigonometric Functions

P6.1 Define (using the unit circle), graph, and use all trigonometric functions of any angle. Convert between radian and degree measure. Calculate arc lengths in given circles.

P6.2 Graph transformations of the sine and cosine functions (involving changes in amplitude, period, midline, and phase) and explain the relationship between constants in the formula and transformed graph.

P6.3 Know basic properties of the inverse trigonometric functions $\sin^{-1} x$, $\cos^{-1} x$, $\tan^{-1} x$, including their domains and ranges. Recognize their graphs.

P6.4 Know the basic trigonometric identities for sine, cosine, and tangent (e.g., the Pythagorean identities, sum and difference formulas, co-functions relationships, double angle and half-angle formulas).

P6.5 Solve trigonometric equations using basic identities and inverse trigonometric functions.

P6.6 Prove trigonometric identities and derive some of the basic ones (e.g., double-angle formula from sum and difference formulas, half-angle formula from double angle formula, etc.).

P6.7 Find a sinusoidal function to model a given data set or situation and explain how the parameters of the model relate to the

data set or situation.

P7 Vectors, Matrices, and Systems of Equations

P7.1 Perform operations (addition, subtraction, and multiplication by scalars) on vectors in the plane. Solve applied problems using vectors.

P7.2 Know and apply the algebraic and geometric definitions of the dot product of vectors.

P7.3 Know the definitions of matrix addition and multiplication. Add, subtract, and multiply matrices. Multiply a vector by a matrix.

P7.4 Represent rotations of the plane as matrices and apply to find the equations of rotated conics.

P7.5 Define the inverse of a matrix and compute the inverse of two-by-two and three-by-three matrices when they exist.

P7.6 Explain the role of determinants in solving systems of linear equations using matrices and compute determinants of two-by-two and three-by-three matrices.

P7.7 Write systems of two and three linear equations in matrix form. Solve such systems using Gaussian elimination or inverse matrices.

P7.8 Represent and solve systems of inequalities in two variables and apply these methods in linear programming situations to solve problems.

P8 Sequences, Series, and Mathematical Induction

P8.1 Know, explain, and use sigma and factorial notation. P8.2 Given an arithmetic, geometric, or recursively defined sequence, write an expression for the n th term when possible. Write a particular term of a sequence when given the n th term.

P8.3 Understand, explain, and use the formulas for the sums of finite arithmetic and geometric sequences.

P8.4 Compute the sums of infinite geometric series. Understand and apply the convergence criterion for geometric series.

P8.5 Understand and explain the principle of mathematical induction and prove statements using mathematical induction.

P8.6 Prove the binomial theorem using mathematical induction. Show its relationships to Pascal's triangle and to combinations. Use

	<p>the binomial theorem to find terms in the expansion of a binomial to a power greater than 3.</p> <p>P9 Polar Coordinates, Parameterizations, and Conic Sections</p> <p>P9.1 Convert between polar and rectangular coordinates. Graph functions given in polar coordinates.</p> <p>P9.2 Write complex numbers in polar form. Know and use De Moivre’s Theorem.</p> <p>P9.3 Evaluate parametric equations for given values of the parameter.</p> <p>P9.4 Convert between parametric and rectangular forms of equations.</p> <p>P9.5 Graph curves described by parametric equations and find parametric equations for a given graph.</p> <p>P9.6 Use parametric equations in applied contexts (e.g., orbits and projectiles) to model situations and solve problems.</p> <p>P9.7 Know, explain, and apply the locus definitions of parabolas, ellipses, and hyperbolas and recognize these conic sections in applied situations.</p> <p>P9.8 Identify parabolas, ellipses, and hyperbolas from equations, write the equations in standard form, and sketch an appropriate graph of the conic section.</p> <p>P9.9 Derive the equation for a conic section from given geometric information (e.g., find the equation of an ellipse given its two axes). Identify key characteristics (e.g. foci and asymptotes) of a conic section from its equation or graph. P9.10 Identify conic sections whose equations are in polar or parametric form.</p>
<p>COURSE ASSESSMENT PLAN:</p>	<p>QUIZZES/TESTS: The learner should be able to perform well on quizzes and tests, if the learner pays attention in class, studies notes regularly, practices problems, and completes homework independently.</p> <ul style="list-style-type: none"> • Quizzes will be given almost every week. • There will be a test after completion of each chapter. • If the student is absent (excused) on the day a test is given, he/she will make it up upon his/her return to class. • Assignments including tests/quizzes that are missed due to unexcused absence(s) can’t be made up. • Late assignments will be accepted for 75% of earned credit by the date of the test for the chapter and will not be accepted after that day.

	<p>It is the student's responsibility to make up his/her missing work within this time frame.</p> <p>EXTRA CREDIT: I do not offer extra credit. Your score in this course is reflective of your proficiency of the material. Therefore, your grade is based on your knowledge and understanding of the course objectives and concepts.</p>
RECOMMENDED SUPPLIES AND MATERIALS:	<p>The learner is required to bring the following to class everyday:</p> <ul style="list-style-type: none"> • A folder or three-ring binder to keep and organize notes, homework/activities, graded tests/quizzes and reference materials. • Loose leaf and graph paper • Pencils preferred , no pens please • Straight edge • Graphing or scientific calculator (TI-83, TI-84 or TI-34) • Textbook: PRE-CALCULUS
EXTRA HELP:	<p>Additional classroom teacher assistance is provided to the student before and after school. Never be afraid to ask for help. Remember that your success depends on you and your effort.</p>
INSTRUCTIONAL PHILOSOPHY:	<p>This course utilizes lecture, discussion, demonstration, blended learning, and student centered teaching styles. In doing so, the purpose is to maximize learning by branching across many learning and teaching styles and therefore helping all students gain a deeper understanding of mathematics.</p> <p>Learning is a two sided relationship where both the student and the teacher need to put forth their best effort. It is the student's responsibility to put forth that effort in order to get the most that the course, stay engaged, and gain the knowledge and understanding of this math course. Each student should make every effort to do their best in and out of class. By doing their best, students can achieve higher standards, influencing their entire life. By forming these skills, students will exponentially increase their overall academic abilities.</p>
INSTRUCTIONAL ACTIVITIES AND COURSE PROJECTS:	<p>There will be a combination of individual, group and partner work in this class to challenge all students towards their absolute potential. During and after presenting a lesson, the learner will have time to try out assigned problems and ask questions if necessary. Students who use their time</p>

	<p>wisely will be able to finish most of the assigned problems in class but should expect some form of homework daily.</p> <p>The learner will also participate in projects and class investigations in order to achieve the most out of his/her learning experience.</p>
<p>CLASSROOM EXPECTATIONS:</p>	<p>The learner is expected to uphold the values and policies of the Nouvel Catholic Community. The Parent/Student Handbook policies are set forth to create a safe learning environment that will enable you to gain a mastery of academia and become a leader in the world. The policy will be enforced.</p> <ul style="list-style-type: none"> • Come prepared to class every day and ready to learn. • Be in his/her assigned seat with the required materials <u>before the bell rings</u>, otherwise, he/she is marked tardy. • Contribute positively to the learning environment in the classroom. • Show respect toward self, other students, teacher and all personal/school property by words and actions. • Be in compliance with the dress code at all times. <p>ATTENDANCE: Attendance is crucial. Students are expected to attend every scheduled class. It is the learner’s responsibility to keep informed of any announcements, syllabus adjustments, or policy changes made during scheduled classes.</p>
<p>HOMEWORK POLICY AND GRADING SCALE:</p>	<p>The goal of assignments is to help you gain mastery of concepts covered in this course. Your desire should be to work very hard towards the development of your mathematics skills. Homework will be assigned, correct, and collected most days. All assignments must show work and assignments without work will not be accepted. You earn points on homework based on effort and completion (100% - 5 pts., 95% - 4 pts., 90% - 3 pts., 85% - 2 pts., 80% - 1 pt., assignments less than 80% complete will not be accepted.) Late assignments will be accepted for 75% of earned credit by the day of the test for the chapter and will not be accepted after that day. Students should expect to have at least one quiz or test a week over the concepts covered.</p> <p>Tests, Quizzes, & Projects: 75% of overall grade Homework: 25% of overall grade</p>
<p>CONTACT INFORMATION:</p>	

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