Precalculus –Mr. J. Wong, Rm. 237
Email: james.wong@maryknollschool.org
Voice Mail: 952-7285

Essential School at Maryknoll
Trimester 2, 2008-09

Precalculus

A. **Course Description** Precalculus is the study of elementary mathematical functions. Among these functions are circular (trigonometric) functions, polynomial, rational, exponential and logarithmic functions. Some consideration is also given to power, direct variation, inverse variation, and logistics functions. It is a Focus course (1 Credit) designed to prepare students for Advanced Placement Calculus or College Calculus. Trigonometry and its applications are the major topics in the first half of the course. Other topics such as the algebra of functions, absolute value and non-linear inequalities, conics, and a review of polynomial, rational, exponential and logarithmic functions will follow. If time permits, topics such as parametric equations, polar coordinates, sequence and series will be introduced. Precalculus is not linked to other courses. However, there are many mathematical connections to other areas of study such as physics, chemistry, astronomy, navigation, surveying, engineering, etc. Using graphic calculator, Geometer's Sketchpad, Excel and/or computer software, you will learn to apply Precalculus mathematics to solve real world problems.

B. **Essential Question** **i. "What are elementary functions and how are they used to solve real-world problems?"**
ii. "How are circular functions used to model PERIODIC phenomena in the real world?"

C. **Course Learning Objectives** You will be expected to demonstrate mastery of these learning objectives which meet the Math Department Wide Learning Expectations (DLE):

- Understand the concept of function; dilation, translation, reflection of functions, numerically, graphically, algebraically, and verbally. (DLE 1, 2, 3, 4, 6)
- Use Right Triangle Trigonometry, Law of Sines and Cosines to solve real world problems. Examples are the height of a mountain, the width of a river, the earth distance between two cities along the same latitude, or the bonding angle between three carbon elements of a diamond gem. (DLE 1, 2, 4)
- Understand the properties of circular functions and sketch their graphs as defined in Analytic Trigonometry. (DLE 1, 2, 4)
- Model periodic phenomena in the real world with a sinusoidal function of the form: $y = d + a \ \text{Sin}\ b\ (x - c)$. (DLE 1, 2, 4)
- Prove the basic trigonometric identities by definitions of trig functions, derive the more advanced identities, and able to make logical connections among these identities. (DLE 2)
- Use the algebraic definition of absolute value and solve non-linear inequalities algebraically and graphically. (DLE 1, 2, 4)
- Know the properties of odd/even functions, the algebra and composition of functions, and inverse functions. (DLE 1, 2, 4)
- Review the properties of polynomial, rational, exponential, and logarithmic functions. (DLE 1, 2, 4)
- Describe the attributes of conic sections and understand the reflective properties of ellipse and parabola. (DLE 1, 2, 4)
- Use modern technology such as graphic calculator to understand precalculus concepts, to solve problems, and to connect graphs to functions; use spreadsheet to process data and word processor to write your Precalculus Portfolio. (DLE 6)

D. **Expected School Learning Results (ESLR)** You will also be expected to acquire these habits central to our learning efforts:

Habits of the Mind – To become a creative and critical thinker and problem solver:

- Accepting responsibility for learning and personal choices
- Valuing learning as a life-long process
- Seizing the challenges of the future with optimism (ESLR I a, b, c, d)

Habits of the Heart -- To practice moral values:

- Understanding, appreciating, and participating in the arts
- Respecting self and others
- Valuing the importance of physical well-being (ESLR II a, b, c, d)

Habits of the Community – To contribute time, energy, and talents to improve the quality of life in our school, community, and nation, while striving for a world of peace and justice:

- Valuing human diversity and demonstrating understanding of other people's languages, cultures, and experiences
- Demonstrating positive social relations and participating in effective collaboration
- Communicate effectively (ESLR III a, b, c, d)

E. **Learning Materials**:

1. Textbook: Foerster, Paul A., Precalculus with Trigonometry: Concepts and Applications, Emeryville, CA: Key Curriculum Press, 2003; ISBN 1-55953-391-9.
2. TI-83Plus graphic calculator.
3. The Geometer's Sketchpad®Dynamic Geometry® Software for Exploring Mathematics, V4.06 or V4.07, Key Curr Press.
4. Large 3-Ring Binder (1.5 to 2-in. to keep ALL math work)
5. Lots of lined folder paper, and graph paper.
6. Writing instruments: mechanical pencils or two sharpened pencils, and red or color pen to correct math work.
7. Drawing instruments: protractor, ruler, compass.

F. **Course Work** Course work are weighted as follows. All need to show work and demonstrate good math process and reasoning.

Course Work	Description	Weight Factor
Formal Testing:	1 Comprehensive Final Exam.	15%
	Weekly Quizzes and/or Tests	55%
Precalculus Portfolio:	Problem Solving Portfolio Work	15%
Assignments:	Daily, Based on Quality and Quantity of work.	15%

Final Exam According to the latest Graduate Survey, Maryknoll graduates indicated that the ability to write for a final exam is extremely crucial to success in college. The Precalculus final exam aims to better prepare you for college, as well as to evaluate how much you learned and how well you retain. In modeling the AP Calculus Exam, the Precalculus Final Exam will similarly have two parts: Part I consists of 40 multiple-choice, "Are you ready for Calculus?" questions designed by the Universities of California and California State Universities, and Part II consists of construct response questions on Precalculus content. Weekly tests may be accumulative and help prepare you for the final exam.

Precalculus Portfolio The Precalculus Portfolio is a major work that reflects your response to one of the two Essential Question "How are circular functions used to model periodic phenomena in the real world?' or "What are elementary functions and how are they used to solve real-world problems?" When approved, this work can be inserted in your Completed Works Compiled (CWC) to satisfy the requirements of your Graduation Portfolio, in the Use of Mathematics.

Assignments, Absence, Make Up Work, Extra Credits Daily assignments must be submitted on time. Late daily assignments without legitimate reason will receive no credit, *as are assignments that do not show some mathematical process or reasoning*. Portfolio work not submitted on time will result in reduction of points on a per day basis. Any student that ends up with D or F in a weekly test is recommended to take a make-up test. The student must schedule a retest within a week and write the test after school. For make up work due to absence, the student must approach the teacher immediately on the returning day. It is the student's responsibility to schedule a make up test. *No make up test is to be scheduled during the last week of the trimester.* For those who struggle in math, improved test scores from the make up tests are a good way to earn extra credits. For those who excel in math, see the teacher for honorary mathematical work to earn extra credits.

Grading Policy In order to prepare you well for AP Calculus or college mathematics, expect the assignment problems, portfolio tasks, and test questions to be challenging. Note that your diligent effort and perseverance, rather than being a math wizard, are the key to success in this course. In order to adjust to the level of difficulty of this course, the following grading system is created to evaluate any work and will be used to compute the cumulative weighted average for the final grade:

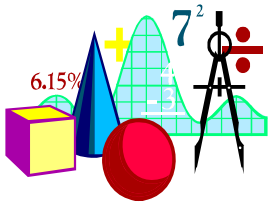
Modified 4-Point Scale P	Cumulative Average CA	Grade	
$3.4 \le P \le 4.0$	$85 \le CA \le 100$	A	Excellent, Superior
$2.8 \le P < 3.4$	$70 \le CA < 85$	B	Good to Very Good
$2.2 \le P < 2.8$	$55 \le CA < 70$	C	Satisfactory to Good
$1.6 \le P < 2.2$	$40 \le CA < 55$	D	Minimum Passing
$0 \le P < 1.6$	$0 \le CA < 40$	F	Unsatisfactory

G. **Behavior Expectation**

- Come to class promptly.
- Have all necessary materials.
- Have done all required homework and be ready to work.
- Act in a way that supports a learning environment; i.e. be attentive, engaging, courteous, respectful, enthusiastic, and helpful.
- Be aware of possible outcomes of choices and behavior especially as it might affect the well being of others.
- Be in proper school dress.
- Follow school rules.

The 3R Plus	Consequences
Be **Respectful...**	First infraction: Personalized consequence aimed at solving the problem.
Be **Responsible...**	Second infraction: Phone call home to parents, reinforced consequences, and after school duty.
Be **Resourceful...**	Third infraction: Conference to include principal and parents, consequences to be set by school

Plus Follow Mr. Wong's instructions.



Maryknoll High School

Mathematics Departmentwide Learning Expectations (DLE)

DLE 1: ***Mathematics Problem Solving***

Each student should be able to solve mathematical problems creatively and critically, using a variety of strategies to investigate, formulate, represent, solve, and generalize problem situations; to model and interpret physical, social, and mathematical phenomena.
(ESLR Habits of the Mind; NCTM 6)

DLE 2: *Mathematics Reasoning*

Each student should be able to reason mathematically, making inferences based on inductive, deductive, proportional, spatial, and statistical reasoning.
(ESLR Habits of the Mind; NCTM 7)

DLE 3: *Mathematics Communication*

Each student should be able to communicate mathematical ideas clearly and coherently by speaking, listening, writing, demonstrating, and depicting them visually.
(ESLR Habits of the Community, Heart, and Mind; NCTM 8, 10)

DLE 4: *Mathematics Connection*

Each student should be able to connect and apply mathematics to other subject disciplines and issues, and to link mathematical concepts.
(ESLR Habits of the Mind, Heart, and Community; NCTM 9)

DLE 5: *Mathematics Disposition*

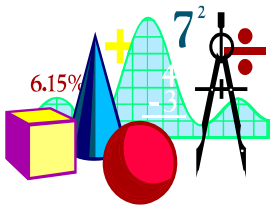
Each student should value the learning of mathematics as a life-long process, demonstrating responsibility, perseverance, independent study, and collaboration in the pursuit of mathematical knowledge.
(ESLR Habits of the Heart, Mind, and Community; NCTM Evaluation Standard)

DLE 6: *Mathematics Technology*

Each student should be able to use modern technology to solve mathematical problems, analyze data, formulate conjectures, and report mathematical ideas.
(ESLR Habits of the Mind and Community; NCTM Technology Principle)

DLE 7: *Mathematics Proficiency*

Each student should be able to pass satisfactorily a competency test on the essential concepts, skills, and applications in each of the four Foundation Courses: Algebra I, Geometry, Algebra II, and Algebra III.
(ESLR Habits of the Mind; NCTM 1, 2, 3, 4, 5)



Maryknoll High School
Mathematics Graduation Requirements

Any Four Mathematics Credits from

Algebra I, Geometry, Algebra II, Algebra III, Trigonometry, Statistics, AP Statistics, PreCalculus, Calculus, AP Calculus

A Mathematics Portfolio

A Mathematics Portfolio demonstrates the student's ability to do, interpret, or use mathematics in a study in any discipline. The portfolio is a collection of important work compiled from any four courses while at Maryknoll and includes one individual sustained effort in problem solving.

Contents: At least four graded works of different levels of mathematics.

Examples:

- **An algebraic model used in physics or chemistry report.**
- **A statistical analysis in social studies.**
- **A project in geometry that contains a conjecture from Geometric Sketchpad and its proof.**
- **A project from Algebra I, II, III, Geometry, Trigonometry, Precalculus, Statistics, AP Statistics, AP Calculus, or other courses.**

Rubrics for Student Work Ethics

Criteria	THE "A" STUDENT	THE "B" STUDENT	THE "C" STUDENT	THE "D" STUDENT
Attitude toward assignments	regards all assignments as opportunities to learn and welcomes them	accepts assignments as methods of learning and usually does them conscientiously	regards assignments as chores and does them grudgingly and irregularly	regards assignments as personal affronts and makes almost no attempt at doing them; disregards lesson plans
Reading	reads widely and willingly, substantially beyond the course requirements	reads what is assigned	does not consistently read what the course requires; substitutes Cliff Notes for texts	almost never knows what reading has been assigned; hasn't bought or has lost books
Writing	writes to extend and to clarify understanding; is never satisfied with less than her best	writes what is assigned	is perennially in danger of failing to meet set deadlines; has little concern for the appearance of work	writes only when confronted with the alternative of failure
Mathematics	**thinks mathematics deeply; does research to clarify understanding; considers multiple methods of solutions to check for accuracy and find elegance; does proofs.**	**thinks mathematics quite often; relies on the teacher to clarify understanding; considers one or two methods of solution; checks the book for accuracy.**	**thinks mathematics only when assigned; depends much on the teacher for understanding; follows rigidly a method of solution; sometimes checks the book for accuracy.**	**avoids thinking mathematically; totally depends on the teacher for understanding; performs math carelessly and incompletely; does not check for accuracy.**
Class participation	contributes effectively to class discussion and stimulates other students to do likewise by helping to promote progressive and reflective debate; listens and responds to others' ideas	contributes usefully to class discussion; is relevant and prepared; listens and responds to others	makes spasmodic efforts to appear to understand what is going on in class discussion; sometimes makes a show of interest by hogging the spotlight or by provoking irrelevant argument	makes no attempt to all to contribute meaningfully to class discussion; wishes she were somewhere else
Attitude toward a course of studies	is determined to make the best of what the teacher and course can offer.	wants to succeed and makes use of conference opportunities	doesn't much care what the course offers and voids conferences like the plague.	is completely indifferent to what the course offers.

Math Homework Rubric

Does Not Meet Expecatation	Approaches but does not meet Expectation	Meets Expectation	Meets Expectation	Exceeds Expectation
0 Point	1 Point	2 Points	3 Points	4 Points
⇒No assignment work turned in ⇒No math work shown	⇒Incomplete work ⇒Few problems are attempted and fewer completed ⇒Work shows no understanding of how to solve the problems ⇒Poor display of graphs ⇒Work shows poor mathematical reasoning ⇒Work is barely (if at all comprehensible	⇒Most of the problems are attempted and at least half completed ⇒Work sometimes communicates the thinking used in solving the problems ⇒Acceptable display of graphs ⇒Solving the problems shows some understanding of the central mathematical concepts and procedural knowledge to use to solve the problem ⇒Work shows adequate mathematical reasoning ⇒Work is sloppy but not incomprehensible	⇒All of the problems are attempted and most completed ⇒Work usually communicates the thinking used in solving the problems ⇒Good display of graphs ⇒Solving the problems shows essential grasp of the central mathematical concepts and procedural knowledge to use to solve the problem ⇒Work shows good mathematical reasoning ⇒Work is somewhat neat and comprehensible	⇒All problems are completed ⇒Work communicates thinking clearly and comprehensively using some combination of written, symbolic or visual means ⇒Excellent display of graphs ⇒Solving the problems shows full grasp and use of the central mathematical concepts and procedural knowledge to use to solve the problem ⇒Work shows strong mathematical reasoning ⇒Work is neat and easily read

Course Outline for ___Precalculus___.

2nd Trimester, 2008-2009 SY **Period: AE & CG** **Teacher: ____Mr. J. Wong___.**

Week	Main Topics	Primary References	Major Exhibitions/ Tests/Projects	Note
1 Nov. 17-21	Functions: Algebraic., Numerical, graphical, & verbal representations The Family of Elementary Functions Dilation, Translation, Reflection Transformation	Ch. 1.1-1.3	Test	11/20 Soph. Retreat
2 Nov. 24-26	Right Triangle Trigonometry Applications of Right Triangle Trigonometry Periodic Functions Analytic Trigonometry & Radian Measures	Ch. 2.1-2.6 Ch. 3.4	Test	11/27 - 28 Thanksgiving Break
3 Dec. 1-5	Sinusoidal Functions Unit Circle & Graphs Applications of Analytic Trigonometry Modeling Periodic Phenomena In the Real World	Ch. 3.1, 3.2, 3.5, 3.7	Test	12/03 - 04 Parent-Teacher Nights
4 Dec. 8-12	Circular Functions Solving Trigonometric Equations Inverse Trig. Relations & Functions Basic Trigonometric Identities	Ch. 3.3, 3.6, 3.8; Supplements Ch. 2.5, 4.4, 4.6; Ch. 4.1, 4.2, 4.3	Test Begins Portfolio Project	
5 Dec. 15-19	Two-Angle Trigonometric Identities Double-Angle Identities Power Reduction Identities Half-Angle Identities	Ch. 5.2, 5.3, 5.6, 5.7	Test	***Grades Due:*** 12/29
6 Jan. 5-9	Law of Sines & Law of Cosines Trig. Formula & Heron's Formulas for Area of Triangle	Ch. 6.1-6.8	Test	
7 Jan. 12-16	The Algebra of Functions Inverse Functions and Inverse Trig. Functions Composite Functions Odd/Even Functions	Supplements	Test	
8 Jan. 20-23	Polynomial Functions Division Algorithm; Factor Theorem Rational Zero Theorem; Remainder Theorem	Ch. 15.1-15.3; Supplements	Test	1/19 MLK, Jr. Day; 1/21 Junior Retreat
9 Jan. 26-30	Rational Functions Asymptotes: Horizontal., Vertical, Slant	Ch. 15.4; Supplements	Test Portfolio Project Due	1/30 ACCE Day; ***Grades Due:*** *2/02*
10 Feb. 2-5	Absolute Values Functions Piece-wise Functions Non-Linear Inequalities	Supplements	Test	2/06 Faculty & Staff Retreat
11 Feb. 9-13	Exponential Functions Logarithmic & Logistics Functions	Ch. 7.1-7.7	Test	2/09 – 13 Founders Week; 2/10 Founders Day Mass
12 Feb. 17-20	Conic Sections	Ch. 12.1-12.6	Test	2/16 Presidents' Day
13 Feb. 23-26	Algebra Review Final Review	Supplements Ch. 1-7, 12, 15	Final Exam	*2/27 Teacher Work Day;* ***Grades Due:*** 3/04

Christmas Break: 12/22/08 – 1/02/09; Winterball: 12/20/08; Ash Wednesday: 2/25/09

(Note: Pace, order, and lessons may be adjusted to meet the needs of the class as well as personalizing instruction.)