

**LAGUARDIA COMMUNITY COLLEGE
CITY UNIVERSITY OF NEW YORK
MATHEMATICS, ENGINEERING & COMPUTER SCIENCE DEPARTMENT**

**MAT 200: PRECALCULUS (HYBRID)
4 credits, 5 hours
3 hours face-to-face (including 1 lab hour), 2 hour online**

Official Catalog Description

4 credits, 5 hours (4 classroom hours, 1 lab hour)

Prerequisite: MAT 115 or MAT117

This course is intended as a preparation for the study of calculus. Functions and their graphs are analyzed theoretically within a framework that emphasizes their roles in applied settings. Particular attention will be paid to polynomial, exponential, logarithmic, and trigonometric models. Use of graphing utilities (computer algebra systems, scientific/non-graphing calculators, etc.) as analytical tools will be emphasized; the online learning platform MyMathLab will be used.

Instructional Objectives

During the semester, the instructor will aim to:

- 1.) Reinforce and further explore functional patterns as naturally occurring phenomena.
- 2.) Investigate verbal, numerical, graphical, and symbolic representations of functions.
- 3.) Enable students to critically analyze linear, power, and exponential models both algebraically and graphically.
- 4.) Examine rigid and non-rigid transformations both experimentally and analytically.
- 5.) Introduce and explore the inverse function concept and to relate inverse functions to the corresponding original functions.
- 6.) Introduce logarithmic functions as inverses of the exponential functions and to analyze the theoretical consequences of this inverse relationship.
- 7.) Introduce the trigonometric functions and their inverses, present a comprehensive treatment of the sine and cosine functions, and explore applications of them.
- 8.) Facilitate the students' use of graphing utilities as analytical tools.
- 9.) Promote the development of written analyses of mathematical concepts.

Textbook (includes the access code for MyMathLab)

PRECALCULUS: Concepts Through Functions. A Unit Circle Approach to Trigonometry by Sullivan&Sullivan. Second Custom Edition for LaGuardia Community College, 2014 (ISBN-13: 9781269954167). Pearson Education Inc. Published by Pearson Prentice Hall, Inc.

<u>Evaluation</u>	1) Tests (and instructor's quizzes)	45%
	2) Maple Lab, HW Assignments, and Project	20%
	3) Final Examination	35%

Suggested Plan of Lessons for Hybrid Instruction

Online part of the course on [MyMathLab platform](#) with suggested online exercises for each section/topic is available. Also, using a virtual discussion platform ([Piazza Discussion](#) or any other) for virtual student-instructor and student-student interaction and e-learning in Hybrid class is recommended.

Weeks/Lessons	Sections	Pg.	Topic(s) with Suggestions on Subdivision of F2F and Online activities	Suggested Exercises from the Text (online work is done on MyMathLab)
Week 1	F.1–F.3, A.3, A.4	2, A.22	Brief review of basics (recommended for Online study/activity only; students can use lecture slides, tutorials/videos, and other resources available on MyMathLab)	Instructor’s choice
	F.4	34	Circles Face-to-face: major formulas + one example for each typical problem on circles; start section 1.1 Online: additional examples using MML resources	Pg. 38: #23-37 odd, 43, 47,51
	1.1	43	Functions Face-to-face: definition and conceptual problems; typical exercises on domain/range; Online: additional examples using MML resources	Pg. 53: # 1 – 14, 16, 19, 30, 33, 34, 37, 41, 51, 55, 59, 60, 61 – 85 (odd), 95, 104, 106, 107
	1.2	56	Graph of a function Face-to-face: combine sections 1.2 and 1.3 in one lesson; discuss selected examples; Online: additional examples using MML resources	Pg. 61: # 3 – 6, 9, 11, 13, 16, 23 – 27 (odd), 33, 37, 46
	1.3	66	Properties of Functions Face-to-face: combine sections 1.2 and 1.3 in one lesson; discuss selected examples – one for each property; discuss some conceptual examples Online: additional examples using MML resources	Pg. 75 # 6 – 9, 11 – 25 (odd), 39 – 51 (odd), 61 – 69 (odd)
<p>Lab (short introductory session about Maple) – spend about 10 minutes F2F on showing the platform; the rest is for students’ independent work. Remaining part of the Lab hour is used for covering necessary course material F2F.</p> <p>Independent Study Resources (text + online): Appendix C in the textbook (Lab 1, pg. C1 – C7) + online video lessons for additional help.</p> <p>Video: Getting Maple for Free (Further assistance can be received in MB39, if needed) Maple Basics How to assign values in Maple</p>				
Week 2	1.4	78	Library of Functions. Piece-wise defined functions Face-to-face: Go quickly through the library of basic functions using slides, demonstrate how to graph piece-wise functions and find their domain and range. Online: additional examples using MML resources	Pg. 85: # 22, 25, 28, 31, 33, 35, 41, 43, 47
	1.5	89	Graphing Techniques: Transformations Face-to-face: Show various transformations using slides, demonstrate few by hand. Online: additional examples using MML resources	Pg. 97: # 7, 9, 28, 29, 35 – 57 (odd), 93
	2.1	119	Properties of Linear Functions. Models. (recommended for online study; brief discussion of linear modeling face-to-face during Lab hour)	Pg. 126: #7, 18, 25, 27, 37, 41, 43, 45, 51, 53, 61
<p>Lab – Online. The lab hour is used for covering necessary material face-to-face + answering students’ questions about online platforms.</p> <p>Independent Study Resources (text + online): Appendix C in the textbook (Lab 2, pg. C7 – C14) + online video lessons for additional help. Homework Lab assignment from the suggested homework exercises in App. C, Lab 2.</p> <p>Video: Function Basics in Maple Function Transformations in Maple</p>				

Week 3	2.3	137	Quadratic Functions Face-to-face: motivation, definition + selected examples to address typical problems; start section 2.4 Online: additional examples using MML resources	Pg. 145: # 1 – 3, 8, 11, 15, 17, 25, 28, 31, 43, 47, 55, 102, 105
	2.4	148	Properties of Quadratic Functions Face-to-face: combine sections 2.4 and 2.5 in one lesson; list the properties (using slides or by hand) + selected examples to demonstrate properties; Online: additional examples using MML resources	Pg. 157: # 5 - 7, 12, 35, 39, 47, 61, 63, 71, 81, 83, 89, 95
	2.5	160	Inequalities Involving Quadratic Functions Face-to-face: selected examples to address typical problems; Online: additional examples using MML resources	Pg. 163: # 5 – 19 (odd), 25, 33, 35, 37
	<p>Lab. Face-to-face: In-class 10 min. Quiz is recommended. Remaining part of the Lab hour is used for Maple and covering necessary material Independent Study Resources (text + online): Appendix C in the textbook (Lab 3, pg. C15 – C24) + online video lessons for additional help. Video: Linear Modeling in Maple Quadratic modeling in Maple</p>			
Week 4 Lessons 16 – 20	2.6	164	Quadratic Models Face-to-face: combine sections 2.6 and 2.8 in one lesson by doing typical examples Online: additional examples using MML resources	Pg. 171: #3, 5, 7, 10. It is suggested to use problems similar to #27 – 30 for the Lab sessions using Maple and HW/Lab assignments
	2.8	178	Equations & Inequalities Involving Absolute Value Functions Face-to-face: combine sections 2.6 and 2.8 in one lesson by doing typical examples Online: additional examples using MML resources	Pg. 181: # 13 – 21 (odd), 29, 47 – 57 (odd), 67, 75
	3.1	192	Polynomial Functions Face-to-face: combine sections 3.1 and 3.2 in one lesson by doing typical examples Online: additional examples using MML resources	Pg. 207: # 6, 23, 27, 37, 41, 49, 51, 61, 71 – 77 (odd), 114, 124
	3.4	232	Properties of Rational Functions. Asymptotes. Face-to-face: combine sections 3.1 and 3.2 in one lesson by doing typical examples Online: additional examples using MML resources	Pg. 240: # 13 – 23 (odd), 27, 28, 29, 43, 49, 50
	Lab. Review for Exam #1			
Week 5 Lessons 21 - 25	Exam #1			
	4.1	274	Composite functions Face-to-face: combine sections 4.1 and 4.2 in one lesson by doing typical examples. Online: additional examples using MML resources	Pg. 279: # 7(a, d), 9(a), 11, 16, 21, 25, 27, 35, 41, 47, 50, 53, 56
	4.2	282	One-to-one functions. Inverse Functions Face-to-face: combine sections 4.1 and 4.2 in one lesson by doing typical examples. Pay attention to conceptual problems (concepts such as relation, not one-to-one function, one-to-one function should be emphasized) Online: additional examples using MML resources	Pg. 290: # 12, 27, 29, 33, 41, 45, 51, 59, 65, 67, 77, 92, 98
<p>Lab. Maple content is done online Lab hour is used for further demonstration of linear and quadratic modeling using Maple and <i>introducing</i> the Inquiry and Problem Solving project with digital competency for depositing to ePortfolio: IPS Project Assign the Project. Give instructions. Independent Study Resources (text + online): Appendix C in the textbook (Continue Lab 4, pg. C15 – C24, C41 – 46) + online video lessons for additional help. Video: see Week 3</p>				

Week 6 Lessons 26 - 30	4.3	294	Exponential functions. Face-to-face: combine sections 4.3 and 4.4 in one lesson Online: additional examples using MML resources	Pg. 305: # 25, 29, 33, 41, 43, 53, 54, 57, 61- 81 (odd), 91, 99, 104, 105, 107, 109, 120
	4.4	311	Logarithmic functions Face-to-face: combine sections 4.3 and 4.4 in one lesson Online: additional examples using MML resources	Pg. 320: # 4, 9, 15, 17, 21, 25 – 37, 59, 72, 89 – 101 odd, 119, 120, 123, 133
	4.5	324	Properties of logarithms Face-to-face: state all properties; give typical examples Online: additional examples using MML resources	Pg. 331: # 2, 3, 7, 9, 12, 13 – 29 (odd), 37 – 51(odd), 57 – 63 (odd), 111
	4.6	333	Exponential and logarithmic equations Face-to-face: present typical equations and explain how to solve them; pay attention to the domain Online: additional examples using MML resources	Pg. 337: # 5 – 43 odd, 49, 53, 87
<p>Lab. Maple content is done online Independent Study Resources (text + online): Appendix C in the textbook (Continue Lab 4, pg. C24 – C29, Lab 5, C30 - 33) + online video lessons for additional help. Video: Applications of Exponential Functions</p>				

Week 7 Lessons 31 – 35	4.7	339	Financial models. Compound Interest.	Pg. 346: # 9, 13, 21, 31, 35, 39, 41, 48, 51
	4.8	349	Exponential Growth and Decay models	Pg. 356: # 1, 2, 3, 5, 7
	Review for Exam #2			
Lab. Use Lab hour for review				
Week 8 Lessons 36 – 40	Exam #2			
	5.1	376	Angles and their Measure Face-to-face: combine sections 5.1 and 5.2 in one lesson by doing typical examples Online: additional examples using MML resources	Pg. 385: # 11, 17, 19, 20, 37, 39, 45, 47, 57, 71, 73, 79, 91, 99,107
	5.2	390	Trig. Functions (Unit Circle)	Pg. 402: # 13, 14, 21, 31, 35, 41, 47, 49, 51, 77, 83, 85, 89, 121, 123
	5.2	390	Trigonometric functions. Continued. Face-to-face: combine sections 5.2 and 5.3 in one lesson Online: additional examples using MML resources	Pg. 402: # 77, 83, 85, 89, 121, 123
	5.3	407	Properties of Trigonometric Functions.	Pg. 417: # 5, 17, 19, 20, 25, 27, 35, 43, 59, 60, 63, 67, 69, 77, 80, 81, 83, 86
Week 9 Lessons 41 – 45	5.4	420	Graphs of the Sine and Cosine functions Face-to-face: combine sections 5.4 and 5.5 in one lesson. Online: additional examples using MML resources	Pg. 431: #9, 11 – 21 odd, 35 – 65 odd, 77, 79, 86, 87
	5.5	435	Graphs of other circular (trig.) functions.	Pg. 441: #5, 15, 16, 17, 27, 34, 41, 42
	5.6	443	Phase Shift; Sinusoidal curve fitting. Face-to-face: combine sections 5.6 and 6.1 in one lesson. Online: additional examples using MML resources	Pg. 452: # 3 – 11 (odd), 27
	6.1	464	Inverse Trigonometric Functions - I	Pg. 473: # 5, 6, 7, 13 – 23 odd, 37, 41, 45, 61, 65
	<p>Lab. Maple content is done online Independent Study Resources (text + online): Appendix C in the textbook (Lab 6, C33 - 40) + online video lessons for additional help. Video: Trigonometric Functions in Maple Discont Option to Plot</p>			

Week 10 Lessons 46 - 50	Suggestion: Collect the draft of IPS project to make comments and then return it to students to finalize.			
	6.2	476	Inverse Trigonometric Functions - II	Pg. 480: # 9 – 23 odd, 38, 47, 57
	6.3	482	Trigonometric equations	Pg. 487: # 7 – 19 odd, 25, 29, 31, 35, 41, 43, 45, 53, 57, 59, 60, 69 – 75 odd, 93, 95
	6.4	491	Trigonometric identities	Pg. 496: # 3, 10, 12, 13, 19 – 33 odd, 49, 51, 72.
	6.5	499	Sum and difference formulas Face-to-face: combine sections 6.4 and 6.5 in one lesson. Online: additional examples using MML resources	Pg. 508: # 9, 25, 27, 29, 39, 47 – 57 odd, 65, 66, 73
Lab hour is used for covering necessary course material F2F.				
Week 11 Lessons 51 – 55	6.6	511	Double and half angle formulas Face-to-face: combine sections 6.6 and 7.1 in one lesson. Online: additional examples using MML resources	Pg. 518: # 7, 11, 19, 21, 41, 43, 47, 56, 99
	7.1	532	Right Triangle Trigonometry. Applications	Pg. 539: # 9, 11, 15, 19 – 29 odd, 33, 41, 49, 54, 69
	7.2	544	The Law of Sines	Pg. 551: # 5, 9, 16, 17, 19, 25, 41, 47
	Lab hour is used for covering necessary course material F2F, collecting IPS project, depositing to ePortfolio			
Week 12	7.2 continue	545	The Law of Sines. Continue.	
	7.3	555	The Law of Cosines.	Pg. 558: # 9, 17, 19, 33
	9.2 and 9.3	661	Selected topics – Conics, Parabola, Ellipse. Independent Study	Pg. 667: #7 – 27 odd + Instructor’s choice. Pg. 678: # 11 – 31 odd + Instructor’s choice
	Review for the Departmental Final Exam – use one lecture hour and a lab hour for this review			
Departmental Final Examination (cumulative).				

Laboratory attendance is mandatory

All students must submit at least 6 written HW/Lab assignments and a final project.

Suggested Lab Hour Topics (See Appendix C for sample Lab lessons and assignments)

- Domain and Range
- Functions and their properties, Rate of Change
- Transformations of Graphs
- Polynomial Functions: Curve Fitting, Modeling
- Inverse Functions
- Exponential and Logarithmic Functions
- Trigonometric Functions

Remarks About Evaluation

- 1.) Several homework/laboratory writing assignments will be collected during the semester. Each assignment should be submitted by its due date. Assignments turned in late may not receive full credit. In addition, quizzes on homework/lab material may be given at various times during the term.
- 2.) Each of the three examinations will be given in class.
- 3.) The project should be submitted by its due date (sometime during the week before the Final exam week). Papers turned in late may not receive full credit. The project should provide a more complete analysis of material covered in class; it should contain both algebraic and graphical analysis where appropriate.

General Comments

- 1.) The specific topics listed in the suggested lesson plan and the principles of evaluation listed above are both subject to minor modification by the instructor.

- 2.) The instructor will assign homework relevant to the topics in the course. Each student is strongly encouraged to complete these assignments to the best of his or her ability consistently throughout the semester. Generally speaking, the student that follows this recommendation will maximize his or her understanding of the subject matter and achieve optimal performance on examinations.

Performance Objectives

At the end of the semester, the student will be able to:

- 1.) Interpret functional patterns and to create functions describing them.
- 2.) Convert one representation of a function to another.
- 3.) Form linear, power, and exponential models and to apply them in the solution of real-world problems.
- 4.) Employ rigid and non-rigid transformations algebraically and graphically as problem solving tools.
- 5.) Compute inverse functions and to use their properties to obtain more precise algebraic and graphical information about the corresponding original functions.
- 6.) Solve exponential and logarithmic equations and to graph exponential and logarithmic functions both in abstract forms and in the applications of exponential models.
- 7.) Perform computations involving the trigonometric functions and their inverses in both theoretical and applied settings and to graph the sine and cosine functions.
- 8.) Use graphing utilities as aids in the solution of problems.
- 9.) Complete written reports on various topics in the Pre-Calculus subject area.