Date	Fall 2015-2016	Credits	4
Course Title	Mathematics I	Course Number	MATH 113
Pre-requisite (s)	None	Co-requisite (s)	None
Hours	75	Out of Class Work Hours	150

Place and Time of Class Meeting

Wednesday   9:00-11:50 D 401
Friday   9:00-10:50 D 301

Name and Contact Information of Instructor

M.Tuba Gülpınar
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D-333

Book required

(The School recognizes the use of the textbook in the classroom as part of the educational methodology and strategy applied in diverse materials. The textbook is part of the curriculum and is used to reach the student in an effective manner in the classroom. Every student is expected to acquire and use the textbook.)

Thomas' Calculus, 13th Edition in SI Units
George B. Thomas, Maurice D. Weir, Joel R. Hass
Pearson Education Inc.

Classroom expectations for students

Attendance Policy

Students are liable to attend every course, practical and laboratory work of the program they are enrolled and to take the exams and participate in academic work required for achieving the course. Student attendance to all courses is compulsory. Students who do not attend a minimum 70% of the theoretical courses and 80% of the practical courses will be considered as absent for the related courses. Students who do not meet the mandatory minimum requirement of attendance will fail the course. Students who fail a course for not fulfilling minimum attendance requirement are obliged to meet the attendance requirement when they re-take the course.

Student Tardiness Policy

Students are permitted to arrive to the class in the first 15 minutes after the scheduled start of the course; extension of tardiness time is in instructor's discretion.

Course Description (must correspond exactly to Catalog description)

This course will investigate limits, rules of limits, continuity, derivatives, differentiation rules, chain rule, implicit differentiation, maximum-minimum problems, curve sketching, applied optimization problems, integration, Riemann sums, definite integrals, area between curves, volumes of revolution, transcendental functions.

Learning Objectives

At the end of this course the student will be able to:

- Calculate limits by substitution and by eliminating zero denominators.
- Calculate limits of rational functions at infinity.
- Determine continuity behavior of a function at a certain point.
- Obtain limits involving infinity and find asymptotes of a function.
- Apply the basic rules of differentiation and use them to find derivatives of products and quotients.
- Define derivatives of polynomials, trigonometric, exponential, hyperbolic, logarithmic and inverse trigonometric functions.
- Apply the chain rule to find derivatives of composite functions.
- Sketch graphs of rational functions including finding asymptotes, tangents and normals to graphs of functions given in explicit, implicit and parametric forms
- Define standard indefinite integrals and basic rules of indefinite integration.
- Evaluate integrals by substitution with and without suitable hints.
- Evaluate integrals of rational functions by partial fractions and repeated use of integration by parts.
- Formulate the concept of definite integral and its basic properties.
- Write the expression of the fundamental theorem of calculus and apply it for evaluating definite integrals and derivatives of integrals with variable limits of integration
- Find area between curves, volumes and surface areas of solids of revolution, and arc length.

Topical Outline and Schedule

DATE	WEEK 1
SPECIFIC OBJECTIVES	• Describe the course. • Explain the areas the calculus is needed. • Define dependent and independent variables, function, domain, and range. • Graph the easy functions • Define increasing/decreasing and even/odd functions. • Calculate the result of the operations of functions. • Shift, scale and reflect a graph of a function. • Explain trigonometric functions and their properties.
TOPIC (S)	• Syllabus. • 1.1 Functions and Their Graphs • 1.2 Combining Functions; Shifting and Scaling Graphs • 1.3 Trigonometric Functions
LEARNING ACTIVITIES	Discussion of Syllabus. Discuss the effect of the functions' behavior on their graphs. Obtain the trigonometric identities step by step by discussion. Completion of exercises and problems.
OUT OF CLASS WORK ASSIGNMENT	Review the Syllabus. **Homework**: Read Chapter 1, and sections 2.1,.2.2, 2.3 and be prepared to discuss in class. MathXL (This course is based on Thomas' Calculus Global Edition, 12e Copyright 2015 Pearson Education) Doing **Homework I**
DATE	WEEK 2
SPECIFIC OBJECTIVES	• Define average rate of the change, secant line, tangent line and slope of a curve. • Solve related examples. • Explain and exemplify the limit laws • Eliminate zero dominators algebraically to calculate the limit. • Explain the sandwich theorem. • Write precise definition of the limit by the aim of the students. • Find deltas algebraically for given epsilons. • Explain how to find a delta for a given function, L, x and epsilon. • Use the precise definition of the limit to prove the limit laws.
TOPIC (S)	• 2 Limits and Continuity • 2.1 Rates of Change and Tangents to Curves • 2.2 Limit of a Function and Limit Laws • 2.3 The Precise Definition of a Limit
LEARNING ACTIVITIES	Illustrate the limit of a function at a certain point by using its graph and comparing values of the function at the neighborhood of the point. Discuss how to find limit of a function if the function has zero dominator. Completion of exercises and problems.

OUT OF CLASS WORK ASSIGNMENT	**Homework**: Read Chapter 2 and be prepared to discuss in class. MathXL (This course is based on Thomas' Calculus Global Edition, 12e Copyright 2015 Pearson Education) Doing **Homework I**
DATE	**WEEK 3**
SPECIFIC OBJECTIVES	• Define one-sided limits and explain related theorems. • Illustrate continuity behavior of a function at a point. • Explain continuity test and discontinuity types by using several examples. • Illustrate the properties of the continuous functions. • Exemplify the continuous extension of a function to a point. • Explain the intermediate value theorem for continuous functions. • Explain limit of a function at infinity (+/-) and related theorems. • Define and illustrate asymptotes. • Explain precise definition of infinite limits and related examples.
TOPIC (S)	• 2.4 One-Sided Limits • 2.5 Continuity • 2.6 Limits Involving Infinity; Asymptotes of Graphs.
LEARNING ACTIVITIES	Discuss under which circumstance the function be discontinuous at a point. Make the students inference to define the discontinuity types. Graph a function to illustrate the intermediate value theorem. Graph a function to illustrate the relationship between the function and its the asymptotes. Completion of exercises and problems.
OUT OF CLASS WORK ASSIGNMENT	**Homework**: Read Chapter 2 and section 3.1, 3.2, 3.3 and be prepared to discuss in class. MathXL (This course is based on Thomas' Calculus Global Edition, 12e Copyright 2015 Pearson Education) Doing **Homework II**
DATE	**WEEK 4**
SPECIFIC OBJECTIVES	• Define the derivative of a function. • Calculate the derivatives of the rational functions from the definition. • Exemplify the one-sided derivative. • Prove the differentiation rules.
TOPIC (S)	• 3 Differentiation • 3.1 Tangents and the Derivative at a Point • 3.2 The Derivative as a Function • 3.3 Differentiation Rules
LEARNING ACTIVITIES	Discuss the relationship between related changes and derivative. Write a summary on the relation between limit of the difference quotient, slope, rate of change and derivative. Completion of exercises and problems.
OUT OF CLASS WORK	**Homework**: Read sections 3.4, 3.5, 3.6, and be prepared to discuss in class. MathXL (This course is based on Thomas' Calculus Global Edition, 12e Copyright 2015 Pearson Education) Doing **Homework II**

ASSIGNMENT	
DATE	**WEEK 5**
SPECIFIC OBJECTIVES	• Define the instantaneous rate of change. • Explain motion along a line. • Mention the applications of the derivative in economics. • Define the derivatives of the trigonometric functions and solve some examples. • Explain the chain rule and solve some examples about repeated use of it.
TOPIC (S)	• 3.4 The Derivative as a Rate of Change • 3.5 Derivatives of Trigonometric Functions • 3.6 The Chain Rule
LEARNING ACTIVITIES	Discuss how to find velocity by using position function. Discuss how to find acceleration by the aim of the velocity function. Discuss the relationship between jerk and acceleration. Let the students obtain the derivative of the tangent function by using the derivatives of the sine and cosine functions. Completion of exercises and problems.
OUT OF CLASS WORK ASSIGNMENT	**Homework**: Read sections 3.7, 3.8, 3.9, and be prepared to discuss in class. MathXL (This course is based on Thomas' Calculus Global Edition, 12e Copyright 2015 Pearson Education) Doing **Homework II**
DATE	**WEEK 6**
SPECIFIC OBJECTIVES	• **MIDTERM EXAM I** • Explain how to calculate the derivative of an implicitly defined function. • Calculate the derivatives of higher order. • Solve problems about related rates. • Define linearization and differential of a function. • Compute the estimation of an unknown by using differentials. • Find the error in differential approximation.
TOPIC (S)	• 3.7 Implicit Differentiaton • 3.8 Related Rates • 3.9 Linearization and Differentials
LEARNING ACTIVITIES	Rearrange the formulas of the tangent line and the normal line for implicitly defined functions. Construct the differential equations of the problems step by step by the aim of the students. Completion of exercises and problems.
OUT OF CLASS WORK ASSIGNMENT	**Homework**: Read Chapter 4 and be prepared to discuss in class. MathXL (This course is based on Thomas' Calculus Global Edition, 12e Copyright 2015 Pearson Education) Doing **Homework III**
DATE	**WEEK 7**
SPECIFIC	• . Define absolute maximum/minimum and local maximum/minimum.

OBJECTIVES	• Explain the related theorems • Define increasing and decreasing functions. • Explain the first derivative test for local extrema.
TOPIC (S)	4 Applications of Derivatives 4.1 Extreme Values of Functions 4.2 The Mean Value Theorem 4.3 Monotonic Functions and the First Derivative Test
LEARNING ACTIVITIES	Discuss how to find the absolute extrema of a continuous function on a finite closed interval. Discuss how to determine the monotonic behavior of the function by using derivative. Completion of exercises and problems.
OUT OF CLASS WORK ASSIGNMENT	**Homework**: Read sections 4.4, 4.5, 4.7 and be prepared to discuss in class. MathXL (This course is based on Thomas' Calculus Global Edition, 12e Copyright 2015 Pearson Education) Doing **Homework III**
DATE	**WEEK 8**
SPECIFIC OBJECTIVES	• Define the concavity and explain second derivative test. • Define the points of inflection and solve some examples. • Explain the second derivative test for local extrema. • Explain the steps for sketching the graph of a function. • Solve applied optimization problems. • Explain antiderivative of a function and the related theorems. • Define indefinite integral and the related terms.
TOPIC (S)	4.4 Concavity and Curve Sketching 4.5 Applied Optimization 4.7 Antiderivatives
LEARNING ACTIVITIES	Discuss how to determine concavity of the function on an interval. Help the students to plot the inflection points on the graph by themselves. Construct the objective function of the problem by the aim of the students. Discuss the relationship between antiderivative and the integral. Completion of exercises and problems.
OUT OF CLASS WORK ASSIGNMENT	**Homework**: Read Chapter 5 MathXL (This course is based on Thomas' Calculus Global Edition, 12e Copyright 2015 Pearson Education) Doing **Homework IV**
DATE	**WEEK 9**
SPECIFIC OBJECTIVES	
TOPIC (S)	
LEARNING ACTIVITIES	
OUT OF CLASS WORK	

ASSIGNMENT	
DATE	**WEEK 10**
SPECIFIC OBJECTIVES	• Estimate the area of a region by using lower sums, midpoint rule and upper sums. • Explain the finite sums, and denote its notation. • Explain some properties of the finite sums. • Calculate the limits of the finite sums as n goes to infinity. • Define definite integral of a function over a closed interval and explain related theorems. • Mention the properties of the definite integrals. • Calculate the area under the graph of a nonnegative function. • Calculate the average value of a continuous function.
TOPIC (S)	5 Integration 5.1 Area and Estimating with Finite Sums 5.2 Sigma Notation and Limits of Finite Sums 5.3 The Definite Integral
LEARNING ACTIVITIES	Discuss how to compute the sum. Completion of exercises and problems.
OUT OF CLASS WORK ASSIGNMENT	**Homework**: Read section 5.4, 5.5, 5.6 and be prepared to discuss in the class. MathXL (This course is based on Thomas' Calculus Global Edition, 12e Copyright 2015 Pearson Education) Doing **Homework V**
DATE	**WEEK 11**
SPECIFIC OBJECTIVES	• Explain the mean value theorem for definite integrals, fundamental theorem of calculus, and net change theorem. • Explain the relationship between integration and differentiation. • Calculate the total area of a region. • Explain how to calculate the definite integrals by using substitution method. • Explain the substitution method in definite integrals. • Explain the definite integral of the even and od functions on the symmetric interval. • Explain calculating the areas between curves.
TOPIC (S)	5.4 The Fundamental Theorem of Calculus 5.5 Indefinite Integrals and the Substitution Method 5.6 Substitution and Area Between Curves
LEARNING ACTIVITIES	Discuss how to calculate the area of a region bounded by a negative function. Discuss how to use substitution method in definite integrals. Discuss the simplicity of the calculating integral of an even/odd function. Completion of exercises and problems.
OUT OF CLASS WORK ASSIGNMENT	**Homework**: Read Chapter 6 MathXL (This course is based on Thomas' Calculus Global Edition, 12e Copyright 2015 Pearson Education) Doing **Homework VI**
DATE	**WEEK 12**

SPECIFIC OBJECTIVES	• MIDTERM EXAM II • Calculate the volume by using cross-sections. • Calculate the volume of a solid of revolution by using disc method. • Calculate the volume of a solid of revolution by using washer method. • Calculate the volume of a solid of revolution by using the shell method. • Explain the formula of the arc length of a curve and solve some examples. • Define the area of the surface generated by revolving a curve.
TOPIC (S)	Applications of Definite Integrals 6.1 Volumes Using Cross-Sections 6.2 Volumes Using Cylindrical Shells 6.3 Arc Length 6.4 Areas of the Surfaces of Revolution
LEARNING ACTIVITIES	Obtain the formula of the volume by discussion. Find the formula of the volume by using disc method step by step. Write the formula of the volume by using washer method with perceptions of the students. Write the formula of the volume by using shell method with perceptions of the students. Completion of exercises and problems.
OUT OF CLASS WORK ASSIGNMENT	**Homework**: Read Chapter 7 MathXL (This course is based on Thomas' Calculus Global Edition, 12e Copyright 2015 Pearson Education) Doing **Homework VI**
DATE	WEEK 13
SPECIFIC OBJECTIVES	• Define one-to-one and inverse functions. • Explain how to calculate the derivatives of the inverse function of a differentiable function. • Define the natural logarithm and calculate its derivative by using the fundamental theorem of calculus. • Explain the properties of the logarithms. • Calculate the integrals of the $\tan x$, $\cot x$, $\sec x$, and $\csc x$ by the aim of the logarithmic functions. • Explain the logarithmic differentiation. • Define natural exponantial function and calculate its derivative by the aim of the logarithmic derivative. • Explain the properties of the general exponantial functions. • Obtain the derivative and antiderivative of the general exponantial function. • Define logarithm with base a. • Solve examples of derivatives and integrals involving logarithm with a base.
TOPIC (S)	7 Transcendental Functions 7.1 Inverse Functions and Their Derivatives

	7.2 Natural Logarithms 7.3 Exponential Functions
LEARNING ACTIVITIES	Discuss how to find the inverse of a function. Discuss the simplicity causing by using logarithms while calculating some integrals and derivatives. Discuss the relationship between logarithm and exponential functions. Completion of exercises and problems.
OUT OF CLASS WORK ASSIGNMENT	**Homework**: Read Chapter 7 and be ready to discuss in class. MathXL (This course is based on Thomas' Calculus Global Edition, 12e Copyright 2015 Pearson Education) Doing **Homework VI**
DATE	**WEEK 14**
SPECIFIC OBJECTIVES	• Explain indeterminate form 0/0 and L'Hospital's Rule. • Evaluate the limit of the functions with 0/0, ∞/∞, 0.∞, and ∞-∞ as indeterminate form.. • Calculate the limit of the functions with indeterminate powers. • Explain the Cauchy's Mean Value Theorem. • Define the inverse trigonometric functions and explain their properties. • Obtain derivatives of the inverse trigonometric functions and integrals evaluated with inverse trigonometric functions. • Define the hyperbolic functions and their inverses. • Obtain some identities for hyperbolic functions. • Calculate the derivatives and integrals of the hyperbolic functions. • Obtain the derivatives of the inverse hyperbolic functions and integrals leading to inverse hyperbolic functions.
TOPIC (S)	7.5 Indeterminate Forms and L'Hôpital's Rule 7.6 Inverse Trigonometric Functions 7.7 Hyperbolic Functions
LEARNING ACTIVITIES	Discuss how to express ∞/∞ indeterminate form as 0/0 indeterminate form. Evaluate derivatives and integrals of the hyperbolic functions step by step by the aim of the students. Completion of exercises and problems.
OUT OF CLASS WORK ASSIGNMENT	**Homework**: Read Chapter 7 MathXL (This course is based on Thomas' Calculus Global Edition, 12e Copyright 2015 Pearson Education) Doing **Homework VI**
DATE	**WEEK 15**
SPECIFIC OBJECTIVES	• **Final Exam.**
TOPIC (S)	
LEARNING ACTIVITIES	
OUT OF CLASS	

WORK ASSIGNMENT	

Instructional Methods

In developing methodological strategies, it is best to discuss them between teachers and students in an environment of freedom and mutual agreement in order to ensure that the students make them their own and take responsibility for their execution and for attaining the goals of this course.

The following strategies may be used in this class:

1. A review of the literature.
2. Analysis of assigned readings.
3. Individual and group discussions.
4. Preparation of a didactic plan.
5. Preparation of lecture notes.

Instructional Materials and References

A Complete Course Calculus, 8th Edition.
Robert A. Adams, Christopher Essex
Pearson Canada Inc.
ISBN 978: 0321781079

Assessment Criteria and Methods of Evaluating Students

Grade	Coefficient
AA	4.00
BA	3.50
BB	3.00
CB	2.50
CC	2.00

DC	1.50
DD	1.00
FF	0.00
VF	0.00

Distribution of Grade Elements

In-Term Studies	Quantity	Percentage
Midterm I	1	20
Midterm II	1	20
Homework	6	20
Total	8	60
End-Term Studies	**Quantity**	**Percentage**
Final	1	40
Total	1	40
Contribution Of In-Term Studies To Overall Grade		60
End-Term Studies		40
Total		100

Date Syllabus Was Last Reviewed: September 10, 2016