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**National Taiwan University of Science and Technology**

**2020 Summer Program**

**MATH 111 Calculus 1**

**Course Outline**

**Term: August 03- August 28, 2020**

**Course Code: MATH 111**

**Instructor: Professor Vadim Olshevsky**

**Home Institution: University of Connecticut**

**Office Hours: By Appointment**

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**Credit: 4**

**Course Description:**

Calculus 1 is the first of a sequence of three courses in calculus covering basic calculus. Topics to be covered include a review of functions, limits, differentiation, applications of the derivative, and introduction of integration.

**Course Objectives:** The objective of the course is to build an understanding of the basic principles and applications of differential and integral calculus through lectures, homework, discussion, quizzes, and exams.



**Required Textbooks:**

*Calculus: Early Transcendentals*, 8th Edition, by James Stewart with WebAssign Access Code. Can be purchased directly at

<https://www.cengage.com/c/calculus-early-transcendentals-8e-stewart/9781337771498#compare-buying-options>

It is important that you purchase both the textbook and the WebAssign code, the latter is necessary for the homework assignments.

**Homework:** There will be online WebAssign homework assignments for each section of the text. Each assignment will be made available on several days before the section is covered in class. The due date for each assignment will be set by your instructor and will generally be two or three days after the material is covered in class. You will get five attempts for each question.

**Grading & Evaluation**

	Grade	Range
Attendance and participation: 10%	A	90-100
Homework: 30%	B	80-89
Midterm: 30%	C	70-79
Final: <u>30%</u>	D	60-69
	F	0-59

**Course Schedule**

**Week1** Functions: definition, representation, types, operations, mathematical models. Limits and continuity: limit of a function, the limit law, continuity, definition of a limit. Derivatives: Definition, rates of change

**Week2** Derivatives: Differentiation rules: polynomial, trigonometric, inverse, logarithmic, exponential, implicit functions. The product, quotient, and chain rules.

**Week3** Applications of differentiation: Higher derivatives, linear approximation and differentials, minima and maxima, the Mean Value Theorem, L'Hôpital's rule, limits at infinity and asymptotes, curve sketching.

**Week4** Applications of differentiation: Applied optimization problems Integrals (Anti-derivatives, approximating areas, the definite integral).

Integrals: The Fundamental Theorem of Calculus, substitution rule.



Detailed Course Outline

Week	Chapter	Topic	
1	<b>1 Functions</b>	1.0 Preview of Calculus	
		1.1 Four ways to represent a function 1.2 Mathematical models. A catalog of essential functions.	
	<b>2 Limits and continuity</b>	1.3 New functions from old functions	
		1.5 Exponential Functions	
		1.6 Inverse Functions and logarithms	
		2.1 The tangent and velocity problems 2.2. The limit of a function	
<b>3 Derivatives</b>	2.3 The limit laws. 2.4 Precise definition of a limit		
	2.5 Continuity 2.6 Limits at infinity. Horizontal asymptotes.		
3	<b>3 Derivatives</b>	2.7. Derivatives and the rates of change. 2.8 Derivatives as a function	
		3.1 Derivatives of Polynomials and Exponentials. 3.2 Product and quotient rules 3.3 Derivatives of trigonometric functions	
	<b>4 Applications of derivatives</b>	3.4 The chain rule 3.6 Derivatives of logarithms	
		Exam 1	
		3.7 Rates of change 3.8 Exponential growth and decay	
		3.10 Linear Approximation and Differentials 4.1 Maxima and minima	
		4.2 The Mean Value Theorem 4.3 Derivatives and the shape of the graph 4.4 L'Hôpital's rule	
		4.5 Curve sketching 4.9 Anti-derivatives	
		<b>4</b>	5.1 Approximating areas 5.2 The definite integral
			5.3 The Fundamental Theorem of Calculus 5.5 Substitution Rule
		Exam 2	

**Student responsibilities/expectations:** The main course material will be presented through lectures. Students are advised to keep pace with the course material as it is being presented. Consequently, students should endeavor to attend class and discussion sessions, and spend sufficient time working on assigned homework problems. If for any reason a student misses a class, he/she should endeavor to obtain the notes



and learn the missed material. Students should not hesitate to ask questions or seek additional assistance to ensure that they are staying on pace with the class.

**Examinations:** There will be two midterm exams plus one cumulative final exam. The exams will contain problems to solve and definitions, brief explanations of concepts, and simple proofs.

