

K to 12 BASIC EDUCATION CURRICULUM
SENIOR HIGH SCHOOL – SCIENCE, TECHNOLOGY, ENGINEERING AND MATHEMATICS (STEM) SPECIALIZED SUBJECT

Grade: 11
Core Subject Title: Basic Calculus

Semester: Second Semester
No. of Hours/ Semester: 80 hours/ semester
Prerequisite (if needed): Pre-Calculus

Subject Description: At the end of the course, the students must know how to determine the limit of a function, differentiate, and integrate algebraic, exponential, logarithmic, and trigonometric functions in one variable, and to formulate and solve problems involving continuity, extreme values, related rates, population models, and areas of plane regions.

CONTENT	CONTENT STANDARDS	PERFORMANCE STANDARDS	LEARNING COMPETENCIES	CODE
Limits and Continuity	<i>The learners demonstrate an understanding of...</i> the basic concepts of limit and continuity of a function	<i>The learners shall be able to...</i> formulate and solve accurately real-life problems involving continuity of functions	<i>The learners...</i> 1. illustrate the limit of a function using a table of values and the graph of the function	STEM_BC11LC-IIIa-1
			2. distinguish between $\lim_{x \rightarrow c} f(x)$ and $f(c)$	STEM_BC11LC-IIIa-2
			3. illustrate the limit laws	STEM_BC11LC-IIIa-3
			4. apply the limit laws in evaluating the limit of algebraic functions (polynomial, rational, and radical)	STEM_BC11LC-IIIa-4
			5. compute the limits of exponential, logarithmic, and trigonometric functions using tables of values and graphs of the functions	STEM_BC11LC-IIIb-1
			6. evaluate limits involving the expressions $\frac{\sin t}{t}$, $\frac{1 - \cos t}{t}$ and $\frac{e^t - 1}{t}$ using tables of values	STEM_BC11LC-IIIb-2
			7. illustrate continuity of a function at a number	STEM_BC11LC-IIIc-1
			8. determine whether a function is continuous at a number or not	STEM_BC11LC-IIIc-2
			9. illustrate continuity of a function on an interval	STEM_BC11LC-IIIc-3
			10. determine whether a function is continuous on an interval or not.	STEM_BC11LC-IIIc-4

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CONTENT	CONTENT STANDARDS	PERFORMANCE STANDARDS	LEARNING COMPETENCIES	CODE
			11. illustrate different types of discontinuity (hole/removable, jump/essential, asymptotic/infinite)	STEM_BC11LC-IIIId-1
			12. illustrate the Intermediate Value and Extreme Value Theorems	STEM_BC11LC-IIIId-2
			13. solves problems involving continuity of a function	STEM_BC11LC-IIIId-3
Derivatives	basic concepts of derivatives	1. formulate and solve accurately situational problems involving extreme values	1. illustrate the tangent line to the graph of a function at a given point	STEM_BC11D-IIIe-1
			2. applies the definition of the derivative of a function at a given number	STEM_BC11D-IIIe-2
			3. relate the derivative of a function to the slope of the tangent line	STEM_BC11D-IIIe-3
			4. determine the relationship between differentiability and continuity of a function	STEM_BC11D -IIIf-1
			5. derive the differentiation rules	STEM_BC11D-IIIf-2
			6. apply the differentiation rules in computing the derivative of an algebraic, exponential, and trigonometric functions	STEM_BC11D-IIIf-3
			7. solve optimization problems	STEM_BC11D-IIIg-1
		2. formulate and solve accurately situational problems involving related rates	8. compute higher-order derivatives of functions	STEM_BC11D-IIIh-1
			9. illustrate the Chain Rule of differentiation	STEM_BC11D-IIIh-2
			10. solve problems using the Chain Rule	STEM_BC11D-IIIh-i-1
			11. illustrate implicit differentiation	STEM_BC11D-IIIi-2
			12. solve problems (including logarithmic, and inverse trigonometric functions) using implicit differentiation	STEM_BC11D-IIIi-j-1
			13. solve situational problems involving related rates	STEM_BC11D-IIIj-2

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CONTENT	CONTENT STANDARDS	PERFORMANCE STANDARDS	LEARNING COMPETENCIES	CODE
Integration	antiderivatives and Riemann integral	1. formulate and solve accurately situational problems involving population models	1. illustrate an antiderivative of a function	STEM_BC11I-IVa-1
			2. compute the general antiderivative of polynomial, radical, exponential, and trigonometric functions	STEM_BC11I-IVa-b-1
			3. compute the antiderivative of a function using substitution rule and table of integrals (including those whose antiderivatives involve logarithmic and inverse trigonometric functions)	STEM_BC11I-IVb-c-1
			4. solve separable differential equations using antidifferentiation	STEM_BC11I-IVd-1
			5. solve situational problems involving exponential growth and decay, bounded growth, and logistic growth	STEM_BC11I-IVe-f-1
		2. formulate and solve accurately real-life problems involving areas of plane regions	6. approximate the area of a region under a curve using Riemann sums: (a) left, (b)right, and (c) midpoint	STEM_BC11I-IVg-1
			7. define the definite integral as the limit of the Riemann sums	STEM_BC11I-IVg-2
			8. illustrate the Fundamental Theorem of Calculus	STEM_BC11I-IVh-1
			9. compute the definite integral of a function using the Fundamental Theorem of Calculus	STEM_BC11I-IVh-2
			10. illustrates the substitution rule	STEM_BC11I-IVi-1
			11. compute the definite integral of a function using the substitution rule	STEM_BC11I-IVi-2
			12. compute the area of a plane region using the definite integral	STEM_BC11I-IVi-j-1
			13. solve problems involving areas of plane regions	STEM_BC11I-IVj-2

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Code Book Legend

Sample: STEM_BC11LC-IIIa-1

LEGEND		SAMPLE	
First Entry	Learning Area and Strand/ Subject or Specialization	Science, Technology, Engineering and Mathematics Calculus	STEM_BC11LC
	Grade Level	Grade 11	
Uppercase Letter/s	Domain/Content/ Component/ Topic	Limits and Continuity	
-			
Roman Numeral <i>*Zero if no specific quarter</i>	Quarter	Third Quarter	III
Lowercase Letter/s <i>*Put a hyphen (-) in between letters to indicate more than a specific week</i>	Week	Week one	a
-			
Arabic Number	Competency	illustrate the limit of a function using a table of values and the graph of the function	1

DOMAIN/ COMPONENT	CODE
Limits and Continuity	LC
Derivatives	D
Integration	I

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References:

Anton, Howard, Bivens, Irl, Davis, Stephen. *Calculus: Early Transcendentals*. New Jersey: John Wiley and Sons, , 2002.

Barnett, Raymond, Ziegler, Michael, Byleen, Karl. *Calculus for Business, Economics, Life Sciences and Social Sciences*. Singapore: Pearson Education (Asia), 2003.

Leithold, Louis. *College Algebra and Trigonometry*. Boston: Addison Wesley Longman Inc., 1989, reprinted-Pearson Education Asia Pte. Ltd, 2002.

Leithold, Louis. *The Calculus 7*. New York: Harpercollins College Div., 7th edition, 1995.

Math 53 Module Committee, *Math 53 Elementary Analysis I Course Module*. Q.C.: Institute of Mathematics, UP Diliman, 2012.

Stewart, James. *The Calculus: Early Transcendentals*. California: Brooks/Cole, 6th Edition, 2008.

Tan, Soo T., *Applied Calculus for the Managerial, Life and Social Sciences*. California: Brooks/Cole, Cengage Learning, 9th Edition, 2014.