AP Calculus BC – Summer Assignment Name_____

Complete the Summary of AP Calculus AB.

KEY THEOREMS	Example
Intermediate Value Theorem for Functions (Ch. 2 – p. 83) Required conditions: Theorem:	
Intermediate Value Theorem for Derivatives (Ch. 3 – p. 115) Required conditions: Theorem:	
Mean Value Theorem for Derivatives (Ch. 5 – p. 202) Required conditions: Theorem:	
Mean Value Theorem for Integrals (Ch. 6 – p. 296) Required conditions: Theorem:	
Extreme Value Theorem (Ch. 5 – p. 194) Required conditions: Theorem:	
Fundamental Theorem of Calculus (Ch. 6 – p. 302) Required conditions: Theorem – Part 1: Theorem – Part 2: Theorem – Part 3:	

Definitions	Example
Slope of a Curve at a Point (Ch. 2 – p. 90)	
Average Rate of Change (Ch. 2 – p. 87)	
Definition of a Limit (p. 584)	
Instantaneous Rate of Change (Ch. 2 – p. 59)	
Definition of Derivative (Ch. 3 – p. 101)	
Position, Velocity and Acceleration	

Tests	Example
Continuity Test (Ch. 2 – p. 81)	
2-sided limits do not exist when: (Ch. 2 – p. 63)	
A Function is not differentiable at a point c when: (Ch. 3 – p. 111)	
First Derivative Test (Ch. 5 – p. 211)	
Second Derivative Test (Ch. 5 – p. 213)	
Relative Rates of Growth (Ch. 9 – p. 461)	

RULES/CONVENTIONS	Example
Ways to write derivatives (Ch. 3 – p. 124) First Derivative: Second Derivative: nth Derivative:	
<u>Rules for Differentiation - Derivative of a Constant:</u> (Ch. 3 – p. 118)	
<u>Rules for Differentiation - Power Rule:</u> (Ch. 3 – p. 118)	
<u>Rules for Differentiation - Product Rule:</u> (Ch. 3 – p. 121)	
<u>Rules for Differentiation - Quotient Rule:</u> (Ch. 3 – p. 122)	
<u>Chain Rule</u> (Ch. 4 – p. 156)	
<u>Implicit Differentiation</u> (Ch. 4 – p. 164)	
<u>Trapezoidal Rule</u> (Ch. 6 – p. 315)	
<u>L'Hospital's Rule</u> (Ch. 9 – p. 452)	

FORMULAS	Example
Linearization (Ch. 5 – p. 238)	
Differential of y (Ch. 5 – p. 241)	
Solving Differential Equations (Ch. 7 – p. 329)	
Integration by Substitution (Ch. 7 – p. 345)	
Exponential Growth and Decay (Ch. 7 – p. 358) Exponential Growth/Decay Equation: Proportional Rate Equation:	
Area between Two Curves (Ch. 8 – p. 397)	
Volume by Slicing (Ch. 8 – p. 407)	
Volume by Disk Method (Ch. 8 – p. 407)	
Volume by Washer Method (Ch. 8 – p. 408)	

GENERAL DERIVATIVE FORMULAS	GENERAL INTEGRAL FORMULAS
$\frac{d}{dx}(C) =$	$\int du =$
$\frac{d}{dx}(x) =$	$\int kdu =$
$\frac{d}{dx}(kx) =$	$\int du + dv =$
$\frac{d}{dx}(u^n) =$	$\int u^n du =$
$\frac{d}{dx}(\ln\lvert u\rvert) =$	$\int \frac{du}{u} =$
$\frac{d}{dx}(\sin(u)) =$	$\int \sin(u)du =$
$\frac{d}{dx}(\cos(u)) =$	$\int \cos(u)du =$
$\frac{d}{dx}(\tan(u)) =$	$\int \sec^2(u)du =$
$\frac{d}{dx}(\sec(u)) =$	$\int \csc^2(u)du =$
$\frac{d}{dx}(\cot(u)) =$	$\int \sec(u)\tan(u)du =$
$\frac{d}{dx}(\csc(u)) =$	$\int \csc(u)\cot(u)du =$
$\frac{d}{dx}e^u =$	$\int \tan(u)du =$ $=$
$\frac{d}{dx}a^u =$	$\int \cot(u)du =$ $=$
$\frac{d(\sin^{-1}u)}{dx} =$	$\int e^u du =$
$\frac{d(\cos^{-1}u)}{dx} =$	$\int a^u du =$
$\frac{d(\tan^{-1}u)}{dx} =$	$\int \frac{du}{\sqrt{1-u^2}} =$
$\frac{d(\cot^{-1}u)}{dx} =$	$\int \frac{du}{1+u^2} =$
$\frac{d(\sec^{-1}u)}{dx} =$	$\int \frac{du}{u\sqrt{u^2-1}} =$
$\frac{d(\csc^{-1}u)}{dx} =$	

AP Calculus AB – Summary Name_____

KEY THEOREMS	Example
Intermediate Value Theorem for Functions (Ch. 2 – p. 83) Required conditions: Theorem:	Intermediate value theorem (video) | Khan Academy
Intermediate Value Theorem for Derivatives (Ch. 3 – p. 115) Required conditions: Theorem:	Worked example: using the intermediate value theorem (video) | Khan Academy
Mean Value Theorem for Derivatives (Ch. 5 – p. 202) Required conditions: Theorem:	Mean value theorem (video) | Khan Academy
Mean Value Theorem for Integrals (Ch. 6 – p. 296) Required conditions: Theorem:	Mean value theorem for integrals (video) | Khan Academy
Extreme Value Theorem (Ch. 5 – p. 194) Required conditions: Theorem:	Extreme value theorem (video) | Khan Academy
Fundamental Theorem of Calculus (Ch. 6 – p. 302) Required conditions: Theorem – Part 1: Theorem – Part 2: Theorem – Part 3:	Proof of fundamental theorem of calculus (article) | Khan Academy Finding derivative with fundamental theorem of calculus (video) | Khan Academy The fundamental theorem of calculus and definite integrals (video) | Khan Academy

Definitions	Example
Slope of a Curve at a Point (Ch. 2 – p. 90)	Derivative as slope of curve (video) | Khan Academy
Average Rate of Change (Ch. 2 – p. 87)	Introduction to average rate of change (video) | Khan Academy Average rate of change review (article) | Khan Academy
Definition of a Limit (p. 584)	Limits: An introduction | Khan Academy
Instantaneous Rate of Change (Ch. 2 – p. 59)	Tangent slope as instantaneous rate of change | Derivatives (video) | Khan Academy
Definition of Derivative (Ch. 3 – p. 101)	The derivative of x^2 at any point using the formal definition (video) | Khan Academy
Position, Velocity and Acceleration	Motion problems with integrals: displacement vs. distance (video) | Khan Academy * Introduction to one-dimensional motion with calculus (video) | Khan Academy

Tests	Example
Continuity Test (Ch. 2 – p. 81)	Continuity introduction (video) | Khan Academy
2-sided limits do not exist when: (Ch. 2 – p. 63)	1-sided vs. 2-sided limits (graphical) (video) | Khan Academy
A Function is not differentiable at a point c when: (Ch. 3 – p. 111)	* Differentiability at a point: algebraic (function isn't differentiable) (video) | Khan Academy * Differentiability at a point (old) (video) | Khan Academy * Differentiability at a point: graphical (video) | Khan Academy * Differentiability at a point: algebraic (function is differentiable) (video) | Khan Academy
First Derivative Test (Ch. 5 – p. 211)	First derivative test for finding relative extrema (article) | Khan Academy
Second Derivative Test (Ch. 5 – p. 213)	Second derivative test | Khan Academy
Relative Rates of Growth (Ch. 9 – p. 461)	Analyzing problems involving related rates (article) | Khan Academy

RULES/CONVENTIONS	Example
Ways to write derivatives (Ch. 3 – p. 124) First Derivative: Second Derivative: nth Derivative:	Second derivatives (video) | Khan Academy
Rules for Differentiation - Derivative of a Constant: (Ch. 3 – p. 118)	Proof of the constant derivative rule (video) | Khan Academy
Rules for Differentiation - Power Rule: (Ch. 3 – p. 118)	Power rule (video) | Applying the power rule | Khan Academy
Rules for Differentiation - Product Rule: (Ch. 3 – p. 121)	Product rule (video) | The product rule | Khan Academy
Rules for Differentiation - Quotient Rule: (Ch. 3 – p. 122)	Quotient rule | Derivatives (video) | Khan Academy
Chain Rule (Ch. 4 – p. 156)	* Chain rule (video) | Khan Academy
Implicit Differentiation (Ch. 4 – p. 164)	* Implicit differentiation (example walkthrough) (video) | Khan Academy Second derivatives (implicit equations): find expression (video) | Khan Academy
Trapezoidal Rule (Ch. 6 – p. 315)	* Trapezoidal sums (video) | Khan Academy
L'Hospital's Rule (Ch. 9 – p. 452)	* L'Hôpital's rule introduction (video) | Khan Academy

FORMULAS	Example
Linearization (Ch. 5 – p. 238)	* Local linearization (video) | Khan Academy
Differential of y (Ch. 5 – p. 241)	* Differential equations introduction (video) | Khan Academy
Solving Differential Equations (Ch. 7 – p. 329)	* Verifying solutions to differential equations (video) | Khan Academy
Integration by Substitution (Ch. 7 – p. 345)	* *u*-substitution intro (video) | Khan Academy
Exponential Growth and Decay (Ch. 7 – p. 358) Exponential Growth/Decay Equation: Proportional Rate Equation:	* Exponential models & differential equations (Part 1) (video) | Khan Academy * Exponential decay intro (video) | Khan Academy * Equations for proportional relationships (video) | Khan Academy
Area between Two Curves (Ch. 8 – p. 397)	* Area between curves (video) | Khan Academy
Volume by Slicing (Ch. 8 – p. 407)	* Volume with cross sections: intro (video) | Khan Academy * Volume with cross sections: semicircle (video) | Khan Academy * Volume with cross sections: triangle (video) | Khan Academy
Volume by Disk Method (Ch. 8 – p. 407)	* Disc method around x-axis (video) | Khan Academy * Disc method rotation around horizontal line (video) | Khan Academy
Volume by Washer Method (Ch. 8 – p. 408)	* Generalizing the washer method (video) | Khan Academy * Washer method rotating around horizontal line (not x-axis), part 1 (video) | Khan Academy

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