AP Calculus BC Semester 1 Review Objectives

Use the objectives below to help prepare for tests and quizzes. Develop a system to rate your mastery of each objective. You may also want to try the listed homework problems for each objective. Underlined problems should be done WITHOUT a calculator.

Chapter 2: Limits and Continuity

2.1 Rates of change and limits

____ Determine limits as x approaches a constant using graphs and expressions
p 67: 49; p 97: 5, 8

____ Find one sided limits, and understand their relation to general limits
P 66: 41

____ Use the properties of limits when finding limits
Pg 67: 55

2.2 Limits involving infinity

____ Find limits as x approaches infinity
P 97: 6, 14

____ Find infinite limits as x approaches a constant
P 76: 13, 15

____ Use limits to find horizontal and vertical asymptotes
P 76: 55

2.3 Continuity

____ Understand continuity at a point and the various types of discontinuities
P 84: 1

____ Determine discontinuities from graphs and functions
P 95: 21-24

____ Understand the Intermediate Value Theorem and its practical implications
P 86: 51

2.4 Rates of Change and Tangent Lines

____ Calculate average and instantaneous rates of change from equations
P 98: 43, 44

____ Calculate average and instantaneous rates of change from graphs and tables
P 137: 5 (and find average value on the interval from 1 to 3)

____ Understand the difference between average and instantaneous rates of change
P 98: 47
____ Use average and instantaneous rates of change in application problems

Chapters 3 & 4: Derivatives

3.1 Derivative of a Function

Know and apply the three definitions of a derivative
- ____ Standard difference quotient
- ____ "x approaches a"
- ____ Symmetric difference quotient

____ Find left and right-hand derivatives
P 109: 31
____ Estimate derivatives from data or graphs
p. 108: 23
____ Given the graph of a function, sketch its derivative
P 151: 59
____ Write equations of lines tangent and normal to a function
P 107: 17

3.2 Differentiability

____ Know how derivatives might fail to exist
____ Given an equation, determine where its derivative is undefined

3.3 Rules for Differentiation

____ Apply differentiation rules to sums, differences, products and quotients
P 150-2: 4, 67
____ Find higher order derivatives

3.4 Velocity and Other Rates of Change

____ Calculate displacement, average velocity or average acceleration
____ Know the derivative position is instantaneous velocity
____ Know the derivative of velocity is acceleration
____ Understand speed as the absolute value of velocity
____ Apply derivatives to motion problems and other rate of change situations
P 138: 9; P 152: 81; p 191: 78

3.5 Derivatives of Trigonometric Functions

____ Know and use the derivatives of the six basic trigonometric functions
____ Write equations of tangents and normals to trig functions
P 148: 31

4.1 Chain Rule

____ Use the Chain Rule to finding derivatives of composite functions
____ Understand the various notations for the chain rule including "inner/outer", decomposition into various functions, and function notation
P 189: 10, 11

4.2 Implicit Differentiation

____ Find first and second derivatives of implicitly defined curves
____ Find equations of tangent and normal lines to graphs of implicit relations
P 189: 35, 41, 47

4.3 Derivatives of Inverse Trigonometric Functions

____ Find derivatives of the six inverse trig functions
____ Understand and work with the relationship between any two inverse functions
P 189: 24, 29

4.4 Derivatives of Exponential and Logarithmic Functions

____ Find derivatives of logarithmic and exponential functions
____ Use the method of logarithmic differentiation to find derivatives
p 189: 13, 19

Chapter 5: Applications of Derivatives

5.1 Extreme Values of Functions

____ Use derivatives to find local and absolute extrema

5.2 Mean Value Theorem

____ Know and apply the Mean Value Theorem
P 208: 1
____ Determine intervals of increasing and decreasing

5.3 Connecting *f* and *f '* with the Graph of *f*

____ Determine intervals of concavity and locations of inflection points
____ Use the second derivative test to verify local extrema
____ Sketch graphs given information about f, f' and f"
____ Interpret graphs to determine information about f, f' and f"
P 220: 3, 7, 23, 37
P 263: 36; 265: 69

5.4 Modeling and Optimization

____ Use derivatives to solve max-min (optimization) problems
P 263: 45, 46

5.5 Linearization and Differentials

____ Write the linearization of a function at a given point and use it to estimate function values near that point
p 263: 39
____ Use differentials to estimate change
P 263: 40, 65a

5.6 Related Rates

____ Set up and solve related rates problems
P 264: 59, 61

Chapter 6: The Definite Integral

6.1 Estimating with Finite Sums

____ Use approximation methods LRAM, RRAM, & MRAM to estimate the area under a curve
____ Interpret the applied meaning of the result for area under a curve
pg 279: 28

6.2 Definite Integrals

____ Write and evaluate a Riemann sum

_____ Understand the connection between a Riemann sum and a definite integral

Ex: $\int_2^5 x^2 dx =$

A) $\lim_{n\to\infty}\sum_{k=1}^{n}\left(2+\left(\frac{3k}{n}\right)^2\right)\cdot\frac{3}{n}$ B) $\lim_{n\to\infty}\sum_{k=1}^{n}\left(2+\frac{3k}{n}\right)^2\cdot\frac{3}{n}$ C) $\lim_{n\to\infty}\sum_{k=1}^{n}\left(\left(\frac{5k}{n}\right)^2\right)\cdot\frac{5}{n}$ D) $\lim_{n\to\infty}\sum_{k=1}^{n}\left(\left(2+\frac{5k}{n}\right)^2\right)\cdot\frac{5}{n}$

_____ Understand the connection of a definite integral to net area
_____ Compute the area under a curve using a numerical integration procedure

6.3 Definite Integrals and Antiderivatives

_____ Apply properties of definite integrals as areas
_____ Apply rules for definite integrals and find the average value of a function
p 325: 38
p 298: 1

6.4 Fundamental Theorem of Calculus

_____ Apply the Fundamental Theorem of Calculus, part 1, to integral functions and graphs
_____ Use the Fundamental Theorem of Calculus, part 2, to evaluate definite integrals and compute enclosed areas.
P 325: 39, 40, 60

6.5 Trapezoidal Rule

_____ Use the Trapezoidal Rule to estimate the area under a curve
P 327: 58

Chapter 7: Differential Equations & Mathematical Modeling

7.1 Slope Fields and Euler's Method

_____ Construct a slope field
_____ Draw a solution curve on a slope field
_____ Connect a slope field to its differential equation
_____ Solve differential equations with initial conditions
_____ Find general solutions to differential equations using antidifferentiation
_____ Use Euler's method to generate approximations of functions from differential equations
P 379: 37, 39-42, 43

7.2 & 7.3 Antidifferentiation by Substitution & Antidifferentiation by Parts

____ Compute indefinite and definite integrals by the method of u-substitution
____ Compute indefinite and definite integrals by the method of integration by parts
____ Solve initial value problems using integration by parts
____ Use tabular integration when appropriate
____ Antidifferentiate using partial fraction decomposition

P 379: 5, 6, 8, 9, 13, 19, 20

7.4 Exponential Growth and Decay

____ Apply integration techniques to solving exponential growth and decay problems
____ Know and apply the Law of Exponential Change
____ Solve separable differential equations
____ Solve applied problems involving half-life decay, compound interest, and cooling
P 379: 31, 32, 55

7.5 Logistic Growth
____ Determine logistic functions from a differential equation
____ Work with a given logistic function to determine carrying capacity, initial value and rates of growth
P 381: 59, 61