AP Calculus BC

Open to any grade level after completion of AP Calculus AB or if a student is recommended by their Integrated Math 3 Honors or Math 2/3 Honors Accelerated teacher (10 Credits)

- *Meets high school graduation requirement for math credits*
- *Meets the UC/CSU subject area "C-mathematics" requirement*

General Information

Description

In **AP Calculus BC**, students will learn all of the concepts taught in AP Calculus AB (listed in plain text) as well as those listed below in **bold** text:

- Evaluating Limits: direct substitution, factor and reduce, multiply by conjugate, find common denominator, divide by highest power of variable – and later in course by L'Hospital's Rule.

- Finding Derivatives of polynomial functions, rational functions, exponential functions, logarithmic functions, trigonometric and inverse trigonometric functions, **parametric equations, polar equations, vector functions**: by definition; product, quotient, chain rules; trigonometric and inverse trigonometric; logarithmic and exponential; implicit differentiation; logarithmic differentiation.

- Applications of Derivatives: equation of tangent line **(including parametric equations, polar equations)**; relative extrema and inflection points; optimization word problems; related rates word problems; position, velocity, and acceleration in function form; **analyze motion of particle modeled in parametric form.**

- Methods of Integration: numerical approximation by Riemann Sum or Trapezoidal Rule; power, exponential, logarithmic, trigonometric and inverse trigonometric, algebraic substitution, **trigonometric substitution, parts, partial fraction decomposition.**

- Applications of Integration: area, volumes of solids of revolution, volumes of solids with known base and cross section, arc length; acceleration, velocity, and position.

- Differential Equations: separation of variables, slope fields, Euler's Method of approximation, exponential growth, logistic growth model.

- Infinite Sequences and Series: tests for convergence and divergence, Taylor and Maclaurin Series.

*Note: Even though the student background for AB and BC are almost the same, students need to be prepared to work at a much faster pace (with more material covered on each test) in the Calculus BC course. *
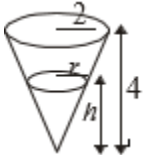
Expectations and Goals

Students must have a

- "C" or better in AP Calculus AB
- Recommendation from their Integrated Math 3 Honors Teacher
- Recommendation from their Integrated Math 2/3 Honors Accelerated Teacher

Students entering AP Calculus AB should already have a good understanding of the following concepts:
- Simplifying expressions, solving equations and inequalities (linear, polynomial, rational, radical, exponential, logarithmic, absolute value); solving systems of linear and polynomial equations.
- Writing equations of linear functions: slope-intercept form, point-slope form, etc.
- Graphing (and recognizing the graphs of) functions and relations including x- and y- intercepts, horizontal, and vertical asymptotes.
- Setting up and solving word problems involving the algebra skills listed above.
- Unit circle values (cos, sin, etc.) for the traditional multiples of $\dfrac{\pi}{6}, \dfrac{\pi}{4}, \dfrac{\pi}{3}, \dfrac{\pi}{2}$ and π.
- Identities (Pythagorean, sum and difference, half and double angle).
- Solving trigonometric equations and systems of equations.
- Graphs of trigonometric functions in the xy-plane. For example, $y = a\cos b(x - c) + d.$
- Application of trigonometry to geometric figures. SKILL OR KNOWLEDGE BASE
- Midpoint, slope, distance formulas.
- Area formulas for common plane figures.
- Lateral area, surface area, and volume formulas for common 3-D figures.

Students entering **AP Calculus AB** should also be able to solve problems such as

Sketch the graph of the following equations without a calculator				
$y = mx + b$	$y = a(x + h)^2 + k$	$x^2 + y^2 = r^2$	$y = \ln x$	$y = \dfrac{1}{x}$
$y = x^3$	$y = \lvert x + h \rvert$	$y = e^x$	$y = 2^x$	$y = \left(\dfrac{1}{2}\right)^2$

Solve for x without using a calculator $$\theta = \dfrac{\pi}{6}$$ $$2\sqrt{3}$$ $$\sqrt{12 - x^2}$$	Shown is a conical tank partially filled with water. Write the formula for the volume of the water as a function of only h.

*Note: Even though the student background for AB and BC are almost the same, students need to be prepared to work at a much faster pace (with more material covered on each test) in the Calculus BC course. *

Estimated Homework

Students will be expected to spend an average of approximately 2 to 3 hours outside of class on homework for each class period.   (This is a general guideline for planning and scheduling purposes. A student's individual ability level and competency may affect the actual preparation times needed.)

There may also be projects such as a final study project following the AP exam.

This Class Is Best For…

Students entering AP Calculus BC are expected to do the following things:
- Learn concepts and skills very quickly.
- Maintain proficiency in above skills as they are applied to new skills.
- Handle the rigor of learning new concepts every day and use new concepts throughout the course.
- Quickly recall concepts and skills learned in previous courses but needed in this course—there is no time to re-teach "old" skills.

Other indicators of potential success in AP Calculus BC include test scores above 85% on the Calculus Readiness Test.

Course Materials

Required Materials

Text book: *Calculus: Early Transcendentals*, 6th edition, Brooks/Cole 2007, Stewart.