



MCB 4U
Advanced Placement Calculus
Course outline/ expectations

Purpose: to cover all aspects of the Ontario curriculum and provide sufficient **depth** for success in the **Advanced Placement** Calculus AB and BC examinations and the University of Waterloo Euclid contest.

How is AP calculus different from regular Calculus ?

Unlike regular Calculus, The AP course has an INTENSE focus on student knowledge of Integration and solving for Volumes of Revolution.

This course covers everything expected in a 1st year University Calculus course and is an excellent lead-in to Calculus II at any Canadian or American Universities.

Textbook & study resources :

1. **Ms. Ng's CD** consisting of compiled notes, previous AP exam questions (sorted by topic) and homework practice questions **for the whole year** will be distributed on the 1st day of class. (**at a cost of \$ 2**)
2. Any links sent via email from Ms. Ng

Preparation for AP exam does not end in Feb. Continuous practice on questions through to May is required for success.

Course Expectations :

1. Students will be trained for proficient use the graphing calculator
2. Students need to attend practice sessions in 2nd semester (after the course is over) to gear up for Euclid and the AP exam scheduled in May.
3. Email is necessary for up-to-date correspondence with Ms. Ng when problems arise.

Ms. Ng's Email : mossy_ng@yahoo.ca

Student/ Teacher goals:

Student and Teacher will be working TOGETHER towards the scoring a "5" on the AP Exam in May.



Strategy for learning/ teaching success :

1. After every unit, students will work through exact AP questions collated by Ms. Ng from previous years exam.
2. There will be a test that will be modeled after the language of the AP exam after every unit.
3. Students need to seek immediate help when problems arise because knowledge in this course is CUMULATIVE. Gaps must be minimized for success in each chapter.

Topics covered: (in sequence)

Time schedule	Material covered
Week 1 to 2.5	<p><u>Functions:</u></p> <ul style="list-style-type: none">• Review of the rules of exponents and how to interchange exponents with log• (Since exponents and log are inverses), review how to graph and solve for inverses of functions.• Tips on how to draw/ recognize polynomial, rational, trig, exponential and logarithmic functions and their INVERSES <p><u>Special AP topic:</u></p> <ul style="list-style-type: none">• What are even and odd functions ?• How to deal with absolute value functions
Week 2.5 to 3	<p><u>Factor and remainder theorem :</u></p> <p><u>Test 1:</u> Graphing functions and F/R theorem</p>
Week 3 , 4	<p><u>Limits of functions :</u></p> <ul style="list-style-type: none">• Review how to recognize patterns for the difference of squares, cubes, sum of cubes• Solving limits by conjugate, factoring (regular or by substitution)• How to graph the limit you just solved.

	<ul style="list-style-type: none"> • Introduce asymptotes (Vertical, Horizontal and Oblique) and how to spot them in a written function. • Extension on “Squeeze theorem” of limits (common AP written question) <p><u>Test 2:</u> Solving limits</p>
Week 5	<p><u>Continuity of functions :</u></p> <ul style="list-style-type: none"> • Is there a relationship between continuity of a function and its differentiability ? (common AP written question) • Graphing discontinuous functions from a set of restrictions • An in depth look at the removability of a discontinuity • Understanding of open and closed intervals <p><u>Quiz 1 :</u> Graphing/ solving for discontinuities in a get set of conditions.</p>
Week 6	<p><u>Derivatives Part 1:</u> (Power, Chain, Quotient, Product, implicit)</p> <ul style="list-style-type: none"> • Solving for the derivative by 1st principles • Power, Chain, Product, Quotient, Implicit rules • Proof of how product rule can be used to derive the quotient rule • Recognizing a given limit as a derivative <p><u>Quiz 2:</u> Power, chain, product, quotient rules (Friday of week 6)</p>
Week 7, 8	<p><u>Application of your knowledge of derivatives (Part 1) by Curve sketching</u></p> <ul style="list-style-type: none"> • Solving for equations of the normal and the tangent • Using 1st derivative to find maximum and minimum points • Using 2nd derivative to find inflection points

	<ul style="list-style-type: none"> • How to deal with cusps points found in (ex: $y = x^{2/3}$) • How to identify the types of asymptotes (vertical, horizontal or oblique) that will be present in a rational function. <p>Test 3: Curve sketching (3 questions) 1 sketch of a rational function with asymptotes 1 sketch involving cusp points 1 sketch with a max/min and IP</p>
Week 9	<p><u>Derivatives (Part 2) Exponential and logarithmic functions</u></p> <ul style="list-style-type: none"> • Derivatives of exponential ($y = e^x$ and $y = a^x$) • Derivatives of logarithmic functions ($y = \log_b x$ and $y = \ln x$) • When to use logarithmic differentiation? <p>Quiz 3: derivatives of exponential and log (Friday of week 9)</p>
Week 10	<p><u>Application of your knowledge of derivatives (Part 2) by Curve sketching of exponential and logarithmic functions</u></p> <p>Test 4: Curve sketching (2 questions) 1 exponential question 1 logarithm question</p>
Week 11-11.5 (3 days)	<p><u>Application of your knowledge of derivatives (Part 2) by solving exponential growth and decay</u></p> <ul style="list-style-type: none"> • The “classic” bacteria question • Half-life (how chemistry relates to math) <p>Quiz 4: 2 questions 1 bacteria, 1 half- life question</p>
Week 11.5, 12.5 (5 days)	<p><u>Derivatives Part 3: (Trig and inverse trig functions) (AP)</u></p> <ul style="list-style-type: none"> • Trig derivatives • Students need to learn how to generate Double Angle and $\frac{1}{2}$ formulas

	<ul style="list-style-type: none"> • Limits of trig functions • Proof of why $\lim_{x \rightarrow 0} \frac{\sin x}{x} = 1$ • What are inverse trig functions ? • Derivatives of inverse trig functions <p>Quiz 4: Derivatives and limits of trig</p>
Week 12.5 to 13 (3 days)	<p><u>Application of your knowledge of derivatives (Part 3) by solving problems involving trig derivatives</u></p> <p>Quiz 5: 2 questions involving either sin or tan.</p>
Week 13 (1 week)	<p><u>Word problems :</u></p> <ul style="list-style-type: none"> • Related rates • Maximum and Minimum word problems (focus mainly on minimizing cost of laying wire question)
Week 14	<p><u>Derivatives Part 4: The law of the mean (AP part)</u></p> <ul style="list-style-type: none"> • Mean Value theorem, Rolle's theorem • Using L'Hopital's Rule to solve for indeterminate forms of a limit. <p>Quiz 6: application of Rolle's theorem (how to write proper proofs)</p>
Week 15, 16	<p><u>Integration: (AP part)</u></p> <ul style="list-style-type: none"> • The definite integral • Fundamental theorem of calculus • Fundamental integration formulas (substitution rule) • Integration by parts • Partial fractions <p>Test 5: integration techniques</p>

Week 17 to 18.5 (7 days)	<p><u>Finding area under curve + volumes of revolution : (AP)</u></p> <ul style="list-style-type: none"> • Approximations to the definite integral: Riemann Sums • Finding area between curves • Volumes of revolution using slices or shells <p><u>Quiz 7:</u></p>
Week 18.5 to 19	<p><u>Differential equations : (AP)</u></p> <ul style="list-style-type: none"> • Solving first order differential equations • 3 questions to focus on: Exponential growth , Restricted growth and Newton's law of cooling (comes up every year) <p><u>Quiz 8 :</u></p>

Evaluation scheme:

All tests, quizzes will be split into 4 categories, KU, TIPS, APP, C, each weighted equally at 25 %

5 Tests :	30% of final mark	(Each test is worth 6% of final mark)
8 quizzes :	20 % of final mark	(Each quiz is worth 2.5 % of final)
Mock AP exam # 1 :	10 %	of final mark
Mock AP exam # 2:	10 %	of final mark
Exam (written)	30 %	of final mark

*** All marks will be posted regularly on Ms. Ng's website
[http:// www.eClassInfo.com/home.asp?id=RSYNg](http://www.eClassInfo.com/home.asp?id=RSYNg)