

Calculus 30 / AP Calculus AB Semester 1

Syllabus – Regina Christian School

**Calculus 30 runs first semester, September to January. AP Calculus extends to Early-May culminating in the AP Exam. The second semester class will be called Calculus 30L which includes all AP concepts (over and above regular Calculus 30 concepts) and advanced integral calculus concepts (May-June). A Calculus 30L syllabus will be given beginning of second semester to those students who continue to the AP Exam.*

Calculus 30L runs January to June.

Course Overview

Students will develop an understanding of the interconnectedness and beauty of calculus topics and to be thoroughly trained and empowered to understand Calculus at a deep level. I hope to help students build a strong foundation that will give them tools to succeed in post-secondary studies and, ultimately, their careers. Students will be required to focus on developing solid work ethic, reasoning skills, and self-assessment. Students will work both collaboratively and as individuals to foster the satisfaction of understanding calculus concepts.

Primary Textbook

- Stewart, James, et al. *Calculus: A First Course*, Toronto, Ont.: McGraw-Hill Ryerson, 1989. (This textbook is similar to textbooks the *University of Regina* and the *University of Saskatchewan* are presently using)

Additional Resources

- Finney, Ross I., et al. *Calculus: Graphical, Numerical, Algebraic*. Upper Saddle River, NJ.: Pearson Education Prentice Hall, third edition 2007.
- AP Central (apcentral.collegeboard.com)
- Thiessen, Burt, *Calculus 30*. Saskatoon, Saskatchewan. Globe Printers Limited, 2005

*Additional resources may be used if I determine areas of student weakness as the course progresses.

Technology Requirement

I have a class set of **Texas Instruments 84 Plus CE** graphing calculators available for student use. We will use the calculator as a tool to assist in learning in a variety of ways including:

- a. Graphing functions (adjusting window settings for useful viewing).
- b. Analyzing functions (roots, values, max/min, derivatives, and Definite Integrals).
- c. Programming/using programs when appropriate.
- d. Identifying and avoiding calculator misuse.
- e. Learning through explorations suitable to graphing calculator display.

Course Outline

The chapter numbers follow *Calculus: A First Course* by Stewart, and we will be studying Chapters 1 to 11 for Calculus 30 and parts of AP Calculus AB. Remaining concepts will be taken from secondary sources listed above. The days listed are guidelines only and will be adjusted to meet the needs of students enrolled in the course as necessary.

Prerequisites for Calculus (Summer study and first 3 days)

- Elementary functions and factoring
- Transcendental Functions (log, exponential, trigonometric)
- Piecewise functions, and absolute value functions
- Asymptotic behavior as limits involving infinity
- Review of Graphing Calculator Usage
 - o Roots, max min values, window settings

Chapter 1: Limits and Continuity (10 days)

- Limits:
 - o Continuity
 - o Limit at a point, limit at infinity, infinite limits
- Tangent Problem (calculating slope of a line using a single point)
- Properties of limits
- One sided limits
- Using limits to calculate slope of a tangent line to a curve.
- Rates of change.

Chapter 2: Derivatives (13 days)

- Definition of f'
 - o Derivative at a point
- Relating the graphs of f and f' When does $f'(a)$ fail to exist?
- Rules for differentiation
 - o Constant, sum, difference, product, quotient, power
- Chain Rule
- Implicit Differentiation
- Higher derivatives

Chapter 3: Applications of Derivatives (7 day)

- Relating first and second derivatives to velocity and acceleration
- Related rates

Chapter 4: Extreme Values (12 days)

- Mean value Theorem
- Using the derivative to find:
 - o Critical point(s) and extreme values
 - o Intervals of increase or decrease (First Derivative Test)
- Optimization problems

Chapter 5: Curve Sketching (10 days)

- Point(s) of inflection and Concavity
- Relating the graphs of f , f' and f''
- Second derivative test

Chapter 7: Derivatives of Trigonometric Functions (5 days)

- Limits of Trig functions
- Derivatives of Trig functions
- Applications of trigonometric derivatives

Chapter 3: Applications of Derivatives (2 days)

- Related rates

Chapter 8: Derivatives of Exponential and Log Functions (8 days)

- Derivatives of Exponential and Log functions

Chapter 9: Differential Equations and Mathematical Modeling (7 days)

- Antiderivatives and the indefinite integral

Chapter 10: Area (4 days)

- Area under a curve and between curves

Chapter 11: Integrals (13 days)

- Using a definite integral to find area, volume, average value of a function
- Fundamental Theorem of Calculus
- Integration by substitution

****This is where the Calculus 30 course ends. The final exam will occur after this material for Calc 30.**

Students enrolled in AP Calculus AB will continue with further concepts after this final exam is given. (The Second semester course (including some AP material) will be called "Calculus 30L"

Further Topics in AP Calculus AB**Chapter 7: Derivatives of Trigonometric Functions (3 days)**

- Derivatives of Inverse Functions
- Applications of trigonometric derivatives

Chapter 8: Derivatives of Exponential and Logarithmic Functions (5 days)

- Derivatives of Exponential and Log functions
- Exponential Growth and Decay

Chapter 9: Differential Equations and Mathematical Modeling (3 days)

- Differential Equations
- Slope Fields

Chapter 10: Area (3 days)

- RAM (Rectangle Approximation Method)
 - o Riemann sums
- Approximating the definite integral:
 - o Trapezoidal Rule

Chapter 11: Integrals (10 days)

- Alternate techniques of integration:
 - o Integration by parts, trigonometric substitution, partial fractions

**AP Central (apcentral.collegeboard.com) and
Calculus: Graphical, Numerical, Algebraic (Ch 6 & 7) (12 days)**

- Rolle's Theorem
- Separable differential equations
- L'Hopital's Rule
- Exponential growth and decay (also Ch 8 Stewart)
- Logistic growth
- Using the definite integral to discuss:
 - o Net change—motion on a line, consumption over time
 - o Area, volume, length of a curve, surface area of a solid of revolution
 - o Work, fluid force

Review (8-10 days)

- Multiple-choice practice, primarily from previous AP exams.
 - o Multiple- Choice test taking strategies are emphasized. Less emphasis on group work and more emphasis on developing personal understanding of concepts studied.
- Free-response practice, primarily from previous AP exams.
 - o Emphasis on complete solutions, including sketches, steps labeled with all work shown and concluding statements.
- Coaching on student development of comprehensive study summaries and “notes to self” which should prove useful not only for the AP final exams but also for future post-secondary mathematical studies.

Marks (Semester 1 Calculus 30)

Evaluations are given to assess each outcome in the curriculum. Marks will be given for performance on each outcome. Outcomes are weighted roughly the same, as each chapter in the textbook roughly corresponds to each outcome. The approximate values are as follows.

Grading

Course work

- Tests 100 marks each
- Quizzes 20 marks each
- Asn'ts 5-20 marks each

Final Grade

- Course work 80%
- Final Exam 20%

Note: In the case of an earned recommend (final exam is NOT written), course work is worth 100% of final grade.

RCS and Regina Public Schools has made the switch to Edsby for grading and communication with students and parents. Mr. Maxwell's website (www.mrmathwell.com) and Edsby will be used for all materials and video lessons.

On my YouTube channel you will find live videos of my classroom lectures by section / concept. If a student misses class or needs to hear the material again, students should access the videos at:

<https://www.mrmathwell.com/index.php/calculus-30/> for the Calculus 30 course and
<https://www.mrmathwell.com/index.php/ap-advanced-placement-calculus-ab/> for the Calculus 30L (second semester) course

Students that miss a class MUST watch the video of the lesson they missed before the next period so as not to get behind. Calculus moves fast and I don't want anyone to fall behind.

Quizzes will be given approx. 1-3 times each chapter. There will be a chapter exam after each chapter is completed.

***Grading:** No penalty will be given for Assignments that are submitted on time. Quizzes, assignments, and tests will be graded, reported, returned and discussed within a two weeks of the due date. If an assignment is submitted after the assessment material has been discussed (answers given etc) then the late assignment will no longer be graded the same way. **Assignments that are not handed in on time (at the beginning of the class on the due date) will be assessed a mark of zero.** This zero will hold until the student hands the assignment in and the teacher has a chance grade the assessment. **Reduced credit may be given to a student's late assignment** based on the information released in class on the concepts evaluated (including if a student hands in an assignment that has already been placed in the assn't return bin). In this case, **the student is to arrange with the teacher an appropriate alternate assignment that may be substituted for full marks, if the student so desires.** This alternate assignment may be given and completed on Course Completion day (Alternate assn't may be given outside of Course Completion at teacher's discretion). **Expect frequent quizzes and other assessments** that will be used to help guide instruction and learning. If you would like some **extra help**, please speak to me so we can arrange a time that works for both our schedules.

Late Policy** – Any assignments that are submitted late are given a mark of zero and **Course Completion policy will be in effect. Assignments may be accepted late without penalty if submitted before information has been released or assn'ts have been marked and returned (see above for more details)

***Missing Tests** - Tests that are missed due to an excused absence must be written *the first day back* to school (on a spare or in study hall at lunch or after school) and **may** require a note or email from parents or doctor confirming the **excused absence**. If a student **misses a second test due to illness, a Doctor's note WILL be required** for a rewrite. Making up a missed exam may be given on course completion days if this procedure is not followed.

***Rewrites** – **There will be no Test or Quiz rewrites.** Missed quizzes are assessed a mark of zero but can be omitted if *homework for the chapter or unit is complete and submitted before exam*. In the event of an excused absence on a test day, when the exam has not been written the day the student returns to school, an alternate exam may be given on Course completion day. This applies to tests originally given within the previous month or since the last course completion date. **There will be opportunity to improve a test mark by good performance on the final exam. ONE chapter exam** that is less than the mark on your final exam will be **OMITTED** should you qualify for the **BOOST** option (more on Earned Options later).

***Course Completion** – Course completion days (half days – afternoon) are designed to help students complete outstanding assignments. It is important that students do the very best they can to keep up to date with all assignments given in this course. This day has been set aside to meet the needs of students, not as a punishment. **Note - These course completion days are sanctioned school days, they are not holidays.** If you have kept up with your work and do not have any evaluations you need to write, then you do not have to come to school. But, **there may be assignments or labs that can only be made up on course completion days** so please don't make plans to miss these days in case you need to be here for some reason.

***Studying** – Students generally have questions about how to properly study for exams and quizzes. I tell them that when they can correctly complete a type of question, without any help or looking at the answer first, then they have sufficiently studied that type of question and are ready for the exam. Having said this, **I allow students 1 small cue card for each of their exams.** They may write anything they want on these cards (no photocopied or printed material) and may use them as prompts during the exam. This does not replace good studying, however. (Not applicable in Calc 30L second semester)

***Homework** – It is important that Students keep up with their homework. The expectation

will be that **all homework is attempted and problems will be addressed with the teacher the following day.** There will be frequent quizzes that the homework prepares the students for. Homework SHOULD be completed for each section before the next section is taught. Students should attempt every question that is assigned. An attempt means that they have, at minimum, written down given information and attempted to use some concept / equation to arrive at a solution. There are ALWAYS examples in the text or notes that are directly or indirectly related to each question assigned. Students should make every attempt to use these examples as well as the ones given in class to determine a reasonable solution. **Homework is used as formative assessment and will not be graded but can be submitted to make up for a missed or failed quiz;** if homework for the chapter or unit is complete and submitted before exam.

***Earned Options** – Students who meet certain criteria based on good study habits, performance on tests and quizzes, submission of asn'ts on time, good attendance, and preparedness for class MAY qualify for a **Recommend** (Final Exam does not need to be written and mark at the end of the semester of classes stands as final grade). If students do not qualify for a recommend or want a chance to have their mark boosted further may qualify for **Boost / Safety Net** option (Final is written but for a boost, the final counts as 20% if final exam mark is higher than mark entering final, and lowest test mark is OMITTED. For Safety Net, if final exam mark is within 10% of mark entering exam students will retain the mark they had before final exam was written). An application will be required to apply for Recommend or Safety Net / Boost. For each course, students must apply for their earned exam option. Application timeline and process will be communicated in class. Classroom teachers will notify students of the status of their application prior to exam week. Students should seek clarification on any denied options directly from the classroom teacher. If, however, questions regarding a denied option remain, students may submit an appeal form to the high school office for administration's consideration. Appeal forms are available on the school website under forms and files.

Boost and Safety Net Eligibility Requirements:

1. Grade entering final is **50% or over**
2. **Twenty** or fewer excused absences total (sickness, sports, appointments, vacation, etc) with **zero** unexcused absences.
3. **Three** or fewer unexcused lates for class (excused late may be extreme weather, teacher keeps you after class and they send you with a note or call teacher, medical appt. with note or call to office, etc)
4. **Three** or fewer late asn'ts (submitted after beginning of class on due date). Students absent on due date should email or submit electronically by the specified time if AT ALL physically able to avoid late designation.
5. **Zero** missing asn'ts or tests at the end of the semester

Recommend Eligibility Requirements:

1. Grade entering final is **90% or over**
2. **Ten** or fewer excused absences total (sickness, sports, appointments, vacation, etc) with **zero** unexcused absences.
3. **Three** or fewer unexcused lates for class (excused late may be extreme weather, teacher keeps you after class and they send you with a note or call teacher, medical appt. with note or call to office, etc)
4. **Three** or fewer late asn'ts (submitted after beginning of class on due date). Students absent on due date should email or submit electronically by the specified time if AT ALL physically able to avoid late designation.
5. **Zero** missing asn'ts or tests (an assignment or test can only be made up by the end of the following course completion date)
6. **Zero** incomplete asn'ts by the end of the following course completion date.

I look forward to this semester with you – please remember to be diligent, to listen carefully during instruction, do your homework faithfully, ask questions when you don't understand, and study for exams. If you work hard, you will succeed!!

God Bless you!

Mr. Maxwell

***PARENTS/GUARDIANS, **PLEASE EMAIL ME** TO LET ME KNOW YOU HAVE READ THIS SYLLABUS, (jeff.maxwell@rbe.sk.ca)

OR,

SIGN BELOW TO INDICATE THAT YOU HAVE SEEN AND READ THE EXPECTATIONS OF YOUR STUDENT FOR THIS CLASS. *Thank You.*

(show this *signed* syllabus to Mr. Maxwell as your first assignment)

Student Name

Parent / Guardian signature

parent email