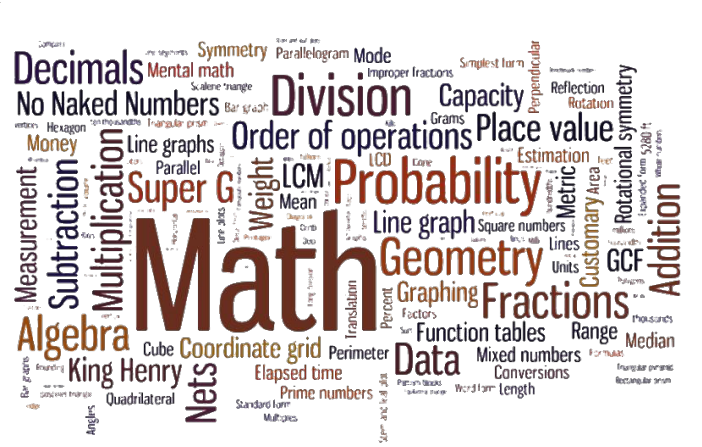

Grade 12 Math 4 / Calculus: 2021-2022 Course Syllabus

"I will never listen to ocean waves or view a beautiful sunset in quite the same way again. That is perhaps the greatest gift one can gain by delving into calculus: It is a whole new way of looking at the world, accessible only through the realm of mathematics."

~ Jennifer Ouellette, The Calculus Diaries: How Math Can Help You Lose Weight, Win in Vegas, and Survive a Zombie Apocalypse

Instructor:
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Digital Portfolio: https://ajv.me

Office Hours:
Tue and Thu: 11:45 AM–12:15 PM
and by appointment

Course Overview:

Mathematics is the language of physics and many other disciplines, such as finance, economics, computer science and engineering (which has sometimes been referred to as applied physics). But mathematics is much more than that. For many mathematicians, mathematics is purely a human endeavor, similar to that of music for musicians and paintings and sculptures for artists: it is pursued for the joy of gaining insight and making new discoveries.

In this course, we will be exploring the world of mathematics from both perspectives. Much of what we will cover will be learning the language of mathematics and using those skills to solve problems, but we will also explore the more abstract nature of mathematics and (hopefully) develop an appreciation of its inherent elegance and how that elegance can manifest in abstract concepts. This exploration will be undertaken primarily using the resources from the CPM Education Program: *Calculus Third Edition*, which has a very strong emphasis on problem-based group work (collaboration and mathematical discourse). Other activities and short projects will also be used as a part of this exploration.

In addition to exploring the world of mathematics, we will also focus on preparation for being successful with college-level mathematics. Students will be supported in learning essential skills: following lectures, note-taking, organization, using textbooks, calculator fluency, using office hours, using on-line resources, and so forth.

The work we do in math, the college preparation work, and what we will present at Exhibition in December will all be connected to the theme of "being a mathematician". You will be reflecting on your growth as a mathematician, your growth in understanding what mathematics is, and your growth in being prepared for college-level mathematics.

Essential Questions for Enduring Understanding:

1. What are the skills and practices that help ensure success in math?
2. How do we prepare for mathematics beyond high school?
3. How can our understanding of math be applied to other disciplines?
4. How can we utilize higher-level mathematics in a meaningful way?
5. How can our mathematical ideas and discoveries be effectively communicated to others?

Course Objectives:

1. Students will gain and apply the skills of mathematicians to various types of problem solving.
2. Students will be able to communicate their ideas and understanding of mathematics.
3. Students will continue to grow in their use of the Habits of a Mathematician to solve challenging problems and make relevant connections to their world.
4. Students will develop confidence in their ability to be successful learning college-level mathematics.

Scope and Curriculum Standards

At High Tech High North County, the scope for Grade 12 Math is an extension of the *Common Core State Standards for Mathematics* that were covered in Grades 9-11 and includes a number of *Big Ideas* and *Enduring Understandings* (EU) from the CPM *Calculus Third Edition*:

1. **Big Idea: Limits**
    - **EU 1:** The concept of a limit can be used to understand the behavior of functions.
    - **EU 2:** Continuity is a key property of functions that is defined using limits.
2. **Big Idea: Derivatives**
    - **EU 1:** The derivative of a function is defined as the limit of a difference quotient and be determined using a variety of strategies.
    - **EU 2:** A function's derivative, which is itself a function, can be used to understand the behavior of a function.
    - **EU 3:** The derivative has multiple interpretations and applications including those that involve instantaneous rates of change.
    - **EU 4:** The Mean Value Theorem connects the behavior of a differentiable function over an interval to the behavior of the derivative of that function at a particular point in the interval.
3. **Big Idea: Integrals and the Fundamental Theorem of Calculus**
    - **EU 1:** Antidifferentiation is the inverse process of differentiation.
    - **EU 2:** The definite integral of a function over an interval is the limit of a Riemann sum over that interval and can be calculated using a variety of strategies.
    - **EU 3:** The Fundamental Theorem of Calculus, which has two different formulations, connects differentiation and integration.
    - **EU 4:** The definite integral of a function over an interval is a mathematical tool with many interpretations and applications involving accumulation.

Class Grading

Assigning a "grade" to student work is an unfortunate consequence of the college admission process: your Math 4 grade must be factored into your GPA for consideration to be accepted. Ideally, your math work would not be graded on a numerical (100%, 90%, 80%, …) or letter (A, B, C, …) scale; rather, verbal and diagnostic written feedback on your progress in this course would be given on a recurring basis (from both your teacher and your peers).

In college, it is very likely you will have courses where you receive two grades: a mid-term test (maybe worth 30% of your final grade) and a final exam (maybe worth 70% of your final grade). For other classes, homework and other assignments may be factored into your final grade. While we do want to prepare you as much as possible for your college experience, your grade for Math 4 would normally be based on your performance in multiple dimensions but would still emphasize the importance of being ready for the college test-taking

experience. This means that you would receive credit for completing your homework, participating in class, contributing to group work, staying on task, abiding by the classroom norms, willingness to get help, willingness to give help, willingness to put in effort on challenge options, and so forth. The majority of your grade, however, will be based on your quizzes/tests/exams; in other words, your formal assessments will be weighted more than all the other dimensions to your grade. The weighting is designed to reflect the expected rigor of the class and to introduce students to college grading schemes: to achieve an A, you will have to demonstrate an understanding of the topics by doing well on the quizzes/tests/exams.

All grades will use a 4-point scale. This ensures that the grade is seen more as a reflection on that particular dimension/assignment and not so much on its contribution to your final grade. Here is the 4-point scale:

Grade	Points	Critique
A	4	Your work meets expectations and qualifies as "beautiful work". It is very likely your work could still be improved, and you are definitely encouraged to think about such improvements for future assignments.
B	3	Your work exhibits authentic effort and mostly meets expectations. You are highly encouraged to use the feedback given to revise your work and resubmit it for a higher grade.
C	2	Your work reflects a good effort and has the potential to be "beautiful work". You are expected to make all the suggested revisions and do a check-in with me to ensure your work meets expectations.
D	1	While your effort to turn in work is appreciated, your work does not reflect your potential. You are definitely expected to meet me to discuss how your work can be transformed into work that meets most—if not all—of the expectations.
F	0	Your work is missing or lacks any originality.

All grades will appear online in PowerSchool and will be updated at least every two weeks, usually much more frequently.

Group participation is a crucial element of learning in this class (and in college and in the "real-world"); however, while students will often be working as a member of a group, group grades will not be given. Students will always be assessed on their individual effort and work.

Note: High Tech High policy is that a grade of a C– or higher is required in both semesters to pass the course. A D+ or lower in any one semester implies a mandatory summer school session. Given the Math 4 grading scheme, this means that a grade of C or higher in both semesters is required to pass the course.

Revising Work for More Credit

Critique and revising work are essential for producing beautiful work. In some cases, the critique and revision process are done formally, in a very structured way; in other cases, you are expected to self-critique or have friends and parents critique your work and do revisions. In some sense, a grade is form of critique from the teacher and it's possible that you may not be satisfied with the grade you received. You are always encouraged to ask if you may revise your work to receive additional credit.

Homework

There are many dimensions to learning mathematics and two important aspects are developing fluency with mathematical procedures and reviewing topics. There is a strong emphasis on rigor in this course, which includes covering topics in depth. To ensure this rigor and for students to develop fluency and review topics, it is necessary for students to do work beyond the classroom. Students should expect homework and structure their time to ensure its completion (this includes homework assigned in class and due the next day).

Please be aware that there is a strong correlation between taking the homework seriously and learning success: if you really put the effort into the homework, you will find that you will retain much more of what you have learned and it will be easier to be successful on the quizzes/tests/exams and to grasp new content. Conversely, if you really do not put a genuine effort into the homework, you will be increasingly challenged with new content and struggle more to complete assignments.

The homework assignments are designed to reinforce the understanding of the foundation concepts as well as new concepts that we cover in class. Some problems may be slightly more challenging in that they require you to apply an understanding of a concept in a new context. Please take advantage of Office Hours if you are having difficulty with questions. As always, you are encouraged to collaborate with friends and peers; however, it is very important that your work is your own and not simply a copy of someone else's.

The Homework Cycle

The Homework is done on a weekly cycle:

- Assignments are entered in Google Classroom and handouts are uploaded to my DP on Friday mornings. Your work is due before midnight on Tuesday evenings.
- On Wednesday mornings, Answers, Solutions, Annotated Solutions, and Video Solutions are posted to my DP. Use the answer/solutions to correct all of the work you submitted and resubmit your work to the same Google Classroom assignment. Your corrected work is due before midnight on Thursday evenings.

Honors Students and those looking for more of challenge: Compare your answers to those posted and attempt to find your own mistakes first. Then check your corrections against the solutions and make additional corrections as needed.

Code of Academic Integrity

All students are expected to adhere to the HTH Code of Academic Integrity. You are certainly encouraged to collaborate and to give and receive help from your peers; however, the work you submit must be original. As noted above in the Grading section, non-original work will receive a grade of F (0/4). Sharing your work with another student so they can copy it is not a form of help: original work that is copied and submitted as non-original work will also receive a grade of F (0/4).

Challenging Yourself

With all the assigned work, I expect the necessary components that show me you understand the concepts, but this is only the minimum. Most assignments/activities will have challenge options (or be structured as open-ended) allowing for a more in-depth exploration of course content and an enhanced development of skills—the opportunity to go beyond the minimum. It is expected that all students challenge themselves.

If you are not feeling sufficiently challenged by the assignments/activities, please let me know as soon as possible: there are options beyond the classroom curriculum that we can explore and use to create a personalized work plan.

Late Work and Absences

Work that is late cannot receive an A, unless you communicate with me **before the deadline** as to why you will not be able to submit the work on time (and I accept your excuse). Work can be submitted up to two days late and receive a 1-point deduction (A quality work becomes a B, B quality work becomes a C, and so on).

While every attempt will be made to give students ample class time to finish class-based activities, please note that some activities will result in homework (or work for Academic Coaching) if the student did not finish in class, and homework assignments with deadlines will be given. Credit for homework will not be given until it is completed; if it is completed late (and before the late deadline), it will receive only partial credit.

Absences

For a scheduled absence (including an early release from class), it is your responsibility to ensure that you leave prepared to complete all assignments that come due during your absence.

If you unexpectedly miss class time, it is your responsibility to stay caught up! Do whatever works best for you to find out what you missed and submit it on time:

- Contact a friend (have contact info for at least two friends you can rely on!)
- Follow the class on my DP
- Contact me

Remember: **ABSENCES DO NOT EXCUSE MISSING WORK.** If you miss an assignment due date because you were absent, it is *your responsibility* to either complete the work during your absence and submit it when you return or come see me as soon as you return to discuss an alternative due date. Remember: it is your responsibility to follow-up after an absence.

Norms for a Supportive and Productive Learning Environment

During the first week of school, we will establish a set of classroom norms, particularly for doing group work. The following is a list the covers items I feel are particularly important for classroom discussion and group work (adapted from "Mathematical Mindsets", by Jo Boaler):

- **Everyone Can Learn Math to the Highest Levels:** There is no such thing as a "math person"—everyone can reach the highest levels they want, with hard work.
- **Mistakes are Valuable:** Mistakes make your brain grow. It is important to struggle and make mistakes.
- **Questions are Really Important:** Always ask questions, always answer questions. Ask yourself: why does that make sense?
- **Math is about Creativity and Making Sense:** Math is a very creative subject that is, at its core, about visualizing patterns and creating solution paths that others can see, discuss, and critique.
- **Math is about Connections and Communicating.** Math is a connected subject, and a form of communication. Represent math in different forms—such as words, a picture, a graph, an equation—and link them.
- **Depth is Much More Important than Speed.** The world's top mathematicians think slowly and deeply; you should too!
- **Math Class is about Learning, Not Performing:** Math is a growth subject, and it takes time to learn. It's not about what you already know; it's all about effort to understand something new.

Student Support

Teacher-student communication is extremely important and encouraged in this class. I will have daily check-ins, but I encourage you to email me with additional questions/concerns. I am here to see you succeed, and I am willing to provide as much assistance as needed. If you should need additional academic support, there are two primary options:

1. My office hours: Tuesdays and Thursdays at lunch (11:45–12:15)
2. Academic Coaching (please inquire for details)

Andrew's Digital Portfolio (DP)

My Digital Portfolio is home to a lot of course information, including, the Daily Agendas, all assignments, this syllabus (in PDF form), class notes, project descriptions, and supplementary resources. Please become familiar with my DP and bookmark the URL (https://ajv.me) so you can access it easily.

Materials and Supplies

The Constitution of the State of California requires that we provide a public education to you free of charge. Subject to certain exceptions, your right to a free public education means that we cannot require you or your family to purchase materials, supplies, equipment or uniforms for any school activity.

Many families have been asking what supplies their child may need during this school year. Below, I have a recommended list of supplies that your child may bring to school. **Please note that if your child does not bring the recommended supplies, the school will provide the supplies for him/her.** If you have any questions/comments about this, please contact me or the school director.

- Pens, Pencils, Markers, Highlighters
- Composition book for note-taking
- 3-ring binder (or equivalent for organizing handouts) + loose-leaf paper
- Ruler
- Calculator (no, you will **not** be able to use the calculator on your smart phone—see below)
- Laptop computer

Electronics

The nature of much of the work we will do in class requires the use of electronics, such as calculators and computers. As such, all students are encouraged to bring calculators and personal laptops to school, if possible. For students without their own calculators or personal computers, classroom calculators and computers are available. For some project work, students without home computers will have to plan to use school computers outside of regular class time.

The following summarizes the "acceptable use" policy:

- No messaging/texting or any form of social media during class. If there's an emergency I will need to know about it anyways, so ask **before** you reply to any urgent message. Texting without permission may result in your phone being confiscated for the remainder of the day. For repeat offenders, your phone will be handed to Ms. Aleida.
- No making or receiving phone calls in class (if there is an urgency, let me know and we'll accommodate you).
- No headphones (or earbuds, AirPods, …) except during individual work time. If I must repeatedly remind you to remove headphones, you will lose the privilege of being able to use them in class.
- No, you may **not** use your phone as a calculator. As part of the goals of college math readiness, you must be able to use your own or a classroom calculator.

Students bringing their own computers to class are required to follow an "acceptable use" policy:

- The computer is being used solely for current classwork
- No creation of personal hot-spots
- No games of any type (this includes games on smart phones or other computing devices)
- No use of external speakers

Misuse of personal computers can vary from temporary confiscation to a permanent revocation of the privilege to use them in the classroom.

Course Schedule

The following is the planned course schedule, outlining the main topics and the associated dates. These dates are approximate: the actual time spent on a topic will depend on students' needs and interests. The important dates are also subject to change: be sure to double-check with the official school calendar.

First Semester Course Schedule

Aug 30 – Sep 10 (9 days)

Introductory Unit: Introductions, Course Overview and Syllabus Review, Class Norms; Summer Assignment Presentations; Algebra Foundations; Foundational Geometry (Area, Rigid Motion, Symmetry); Trigonometric Functions, Logarithms

Important Dates:

- Sep 6 – Labor Day Holiday

Sep 13 – Oct 1 (15 days)

A Beginning Look at Calculus (CPM Chapter 1): Piecewise Functions and Continuity; End Behavior and Asymptotes; Holes, Vertical Asymptotes, and Approach Statements; Inverse Functions, Even and Odd Functions; Finite Differences; Slope Statements; Distance, Velocity, and Acceleration

Important Dates:

- Sep 16 – Back to School Night

Oct 4 – Oct 29 (20 days)

Rates, Sums, Limits, and Continuity (CPM Chapter 2): Area Under a Curve; Summation Notation and Riemann Sums; Limits; Definition of Continuity; Evaluating Limits; Ramp Lab

Important Dates:

- Oct 5 - 7 – SLCs
- Oct 8 – All School Staff Day—No School
- Oct 28 – Senior College App Fest

Nov 1 – Nov 26 (15 days)

Slope and Curve Analysis (CPM Chapter 3): The Power Rule; Secants to Tangents; Definition of a Derivative

Important Dates:

- Nov 11-12 – Veteran's Day
- Nov 22 - 26 – Thanksgiving Holiday

Nov 29 – Jan 14 (25 days)

Exhibition and Exhibition Preparation

(Introduction to…) The Fundamental Theorem of Calculus (CPM Chapter 4): Definite Integrals; Deriving "Area Functions"; Indefinite and Definite Integrals; The Fundamental Theorem of Calculus; Integrals as Accumulators; Area Between Curves

Important Dates:

- Dec 16 – Exhibition
- Dec 17 – 1/2 Day (Senior Grades Due)
- Dec 20 - Dec 31 – Winter Break
- Jan 3 – Staff Day—No School

Second Semester Course Schedule

Jan 17 – Mar 18: (42 days)

(Continuing…) The Fundamental Theorem of Calculus (CPM Chapter 4): Definite Integrals; Deriving "Area Functions"; Indefinite and Definite Integrals; The Fundamental Theorem of Calculus; Integrals as Accumulators; Area Between Curves

Important Dates:

- Jan 17 – Martin Luther King Day
- Feb 5 – Senior Internship Ends
- Feb 18-21 – President's Day Long Weekend
- Mar 4 – All Schools Staff Day—No School
- Mar 9-11 – SLCs

Mar 21 – Mar 25: Intersession Week

Mar 28 – Apr 8: Spring Break

Apr 11 – May 6: (18 days)

Derivative Tools and Applications (CPM Chapter 5): Distance, Velocity and Acceleration Functions; Optimization; The Product Rule; The Chain Rule; Optimization Problems

(Time Permitting…) Related Rates (CPM Chapter 7): Related Rate Applications

Important Dates:

- Apr 11 – Staff Day
- May 6 – Snow Day

May 9 – Jun 10: Internship

Important Dates:

- May 30 – Memorial Day

Jun 13-17: Senior Week

2021-22 Grade 12 Math 4 / Calculus Syllabus

STUDENT / PARENT / GUARDIAN ACKNOWLEDGEMENT

Students/Parents/Guardians, please review the following summary of the syllabus and ensure you understand each point. Please be sure to obtain any necessary clarifications before signing.

- Official grades will appear in PowerSchool and will be updated at least biweekly.
- Grading is on a 4-point scale: 4 (A), 3 (B), 2 (C), 1 (D) and 0 (F).
- A grade of a C or above is required to pass a semester (and avoid a summer school session).
- Absences are not an excuse for missing work. It is the student's responsibility to obtain assignments missed during an absence (or late arrival or early release).
- Unexcused late work cannot receive full credit: late work will be accepted up to two days late (with a 1-point deduction).
- It is the student's responsibility to take advantage of my office hours, which are Tuesdays and Thursdays from 11:45 AM to 12:15 PM (during lunch).
- In the classroom, all electronics are subject to an "Acceptable Use" policy. **Gaming, texting, messaging, and social media apps are not permitted in the classroom.** Policy violations can result in confiscations and permanent bans.
- In the classroom, headphones for audio can only be used during individual work time and not during group work, class discussions, or lectures. Policy violations can result in confiscations and permanent bans.

I, _____ and _____,

Student Name (**please print legibly**) Parent/Guardian Name (**please print legibly**)

have read this 2020-21 Grade 12 Math syllabus, understand the course guidelines and policies, and agree to follow these guidelines and policies.

_____ _____

Student Signature Date

_____ _____

Parent/Guardian Signature Date