AP Calculus AB Syllabus

Instructor: Dr. Chuck Garner

Office Hours: I have Math Team on Tuesdays and Thursdays after school and on Friday mornings before school. The second and fourth Wednesdays of each month after school I run a math seminar. All other times before or after school are available, but you must give me 24 hours notice.

Text: Chuck Garner, *The AP Calculus Problem Book*. Fourth edition, revised and corrected, RMMT Publishing, 2010. $35.00

Additional Resources:

- George B. Thomas, Ross L. Finney, Maurice D. Weir, and Frank R. Giordano. *Thomas' Calculus, Early Transcendentals Part One: Single Variable*, 10th edition, Addison-Wesley, 2003. ISBN 0321123565. $146.00

- The *Visual Calculus* Web Page:
  `http://archives.math.utk.edu/visual.calculus`

Course Description: This course is designed to provide a college-level experience in mathematics. Students will be able to work with functions in numerical, graphical, and algebraic ways and will also understand the relationships between the different representations. Students will understand the concepts of limits, derivatives, and integrals. Students will be able to apply derivatives and integrals to real-world phenomena. Students will understand and apply differential equations. Broad goals for the students include understanding the role of calculus concepts in science and technology; being more than adequately prepared for the AP Calculus exam; and, developing an interest and appreciation for mathematics itself, outside scientific and technological applications.

Materials:
You will need the following materials on a daily basis.

1. a notebook for notes
2. a binder with loose-leaf paper for homework
3. pencils (if you want it graded do it in pencil)
4. a graphing calculator (TI-83 or TI-84 recommended)
5. your textbook

Letter Grades: 90 to 100: A; 80 to 89: B; 75 to 79: C; 70 to 74: D; and below 70: F.

Grades are confidential and will only be discussed with the concerned student and the student's parents.

Evaluation:

First Semester.		Second Semester.	
1 Functions and Limits	310	4 Integrals	410
2 Derivatives	420	5 Applications of Integration	270
3 Applications of Differentiation	300	AP Exam Preparation	100
		Project	200
		Group Investigation	150
TOTALS:	1030		1130

The following formula is used to determine your grade in this class each Semester:

$$\frac{\text{Total points earned}}{\text{Total points possible}}$$

As always, the Final Grade for each semester is computed by

$$\text{Final grade} = 0.8(\text{Semester grade}) + 0.2(\text{Exam Grade})$$

Students are required to keep track of their own grades. You may compare your grade calculations with me after school; I will not discuss grades during the school day.

Practice AP Exam: Sunday, April 24 at 1:00 PM.
AP EXAM: Wednesday, May 4 at 8:00 AM.

Make-Up Work:

Tests No make-up tests will be given unless arrangements are made prior to test day. If a test is missed either semester, that semester's final exam will be used to replace the missed test. There are no exam exemptions. If the average of all test grades and the first semester exam grade is an A, you are exempt from the second semester Project.

Quizzes No make-up quizzes will be given.

Homework No make-up homework assignments will be given, although late homework is accepted with a penalty; see page 4 for details.

Absences Since tests and quizzes cannot be made-up, it is completely irrelevant whether the student's absence is excused or unexcused. It is entirely the student's responsibility to obtain notes, handouts, assignments, and any other information when the student is absent.

Cheating of any kind on any assignment is considered the theft of someone else's intellectual property and will result in zero points for that assignment for all persons involved and possibly a grade of "F" for the course.

This syllabus provides a general plan for the course; deviations may be necessary.

AB Schedule First Semester

Day   Assignment

Day	Assignment
1	1.1, 1.2, TI-Lab 1 due
2	1.3, 1.4
3	1.5
4	Quiz, 1.6, 1.7
5	1.8, 1.9, 1.10
6	1.11, 1.12
7	1.13, 1.14, Calculus Lab 1 due
8	Quiz, 1.15
9	1.16, 1.17
10	1.18, 1.19
11	Quiz, Sample Test
	TEST
12	2.1, 2.2
13	2.3, Calculus Lab 2 due
14	2.4, 2.5
15	2.6, 2.7
16	Quiz, 2.8, TI-Lab 2 due
17	2.9
18	2.10
19	Quiz, 2.11
20	2.12
21	2.13
22	2.14, Calculus Lab 7 due
23	Quiz, 2.16
24	2.17
25	2.18
26	Quiz, 2.19
27	Sample Test
	TEST
28	3.1, 3.2
29	3.3, Calculus Lab 4 due
30	3.4, 3.5
31	Quiz, 3.6, TI-Lab 3 due
32	3.7
33	3.8
34	Quiz, 3.11
35	3.13
36	3.14
37	Quiz, Sample Test
	TEST

AB Schedule Second Semester

Day   Assignment

Day	Assignment
38	4.1, 4.2
39	4.3
40	4.4, 4.5, Calculus Lab 5, TI-Lab 4, TI-Lab 5 due
41	Quiz, 4.6
42	4.7, 4.8
43	Quiz, 4.9
44	4.10
45	4.12, Calculus Lab 6, TI-Lab 6 due
46	4.13, 4.14
47	Quiz, 4.15, 4.16
48	4.18
49	4.19
50	Quiz, Sample Test
	TEST
51	5.1
52	5.2
53	5.2
54	5.3, TI-Lab 7 due
55	5.4
56	Quiz, 5.5. 5.6
57	5.7, 5.8
58	Quiz, 5.9, TI-Lab 8 due
59	5.10
60	Quiz, Sample Test
	TEST

AP review begins:
Quizzes, Project, AP Problems

After AP Exam:
Group Investigations

How To Succeed in This Class

Here are some facts: I want you to succeed. You want yourself to succeed. We should obviously be able to work this out to our mutual satisfaction. What you are about to read is an effort to work this out.[1]

One measure of success, perhaps unfortunately, is your grade. A grade is an inadequate way to measure achievement, but a fairly realistic way to measure performance. Indeed, your performance is always being evaluated by someone or other: a parent, a friend, an employer, or even a casual observer. A teacher simply takes this evaluation a step further and puts a grade on it.

I will measure and grade your performance based on four things: DILIGENCE, KNOWLEDGE, COLLABORATION, and CLEVERNESS. (All academic grades are probably based on the same criteria, whether the grader admits it or not.) Note that only *cleverness* has anything to do with the relative size of your brain, so a grade will not necessarily measure how smart you are.

Your grade will be based on six types of performance: classwork, homework, labs, tests, quizzes, and a project.

CLASSWORK

Everyone must have a notebook that will be devoted exclusively to classwork for this class. Don't worry about filling it up; we will.[2] You must always bring this notebook to class, along with a pencil and a graphing calculator. When class begins, your notebook, pencil, and calculator should be on the table, ready for action. Nothing else should be on your table while you are in this class. Sometimes you will copy what I write on the board; sometimes you will work problems alone; sometimes you will work in groups. Whatever we do, however, you will keep a record of it in the notebook. Your notebook will not be collected.

Meanwhile, I will be evaluating how well you and your classmates work together through personal observation over the course of the semester. How well do you work together with others in groups? (This is the *collaboration* part.) How involved are you in class discussions? How well can you ask a question when you don't understand, and how well can you explain it to others when you do understand? Do you come for extra help when you need it? Does your attitude help the class or hinder it? Based on these criteria I will arrive at a subjective opinion of the class's overall quality, which will determine how grades are curved for your class.[3]

HOMEWORK

There will be a short homework assignment almost every night. You must do mathematics in order to understand it, so doing these assignments is essential. This is also the main opportunity I will have in my grading scheme to reward *diligence*, so students who feel that they might be lacking in the cleverness category should be especially attentive to homework.

Regardless of the assignment, there are basically two steps to doing any math problem:

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[1] This essay is adapted from one by Dan Kennedy of the Baylor School, Chattanooga, Tennessee.

[2] Homework should be done on paper from another source.

[3] See the section concerning TESTS on page 6 for more on the curve.

Step 1: Find out how to do the problem.
Step 2: Do the problem.

The distinction between these two steps, while subtle, is probably the key to success in this course. There are no restrictions whatsoever on how you accomplish the first of these two steps! If you know how to do the problem, fine: Do it. If you do not know how to do the problem then you are at Step 1, and I encourage you to get help wherever you can find it. Read the book. Check your notebook. Talk to a classmate. See me for extra help. Ask your mother. Post a question on `facebook`. Pay a tutor. Different people have different learning styles, and what works for someone else might not work for you. On the other hand, it is your education, and you need to find something that works. Collaboration is *good for you*, as long as it is in Step 1.

Now, once you have learned how to do the problem – this is very important – you are at Step 2, which you must do on your own! That is the performance part, and remember: that is the part that I am grading. If you *COPY* somebody else's homework, then you are (a) cheating for a grade, and (b) defeating the whole learning system by proceeding to Step 2 without ever having confronted Step 1. The extent of such cheating is even greater when one considers that it is precisely the diligence of another student that is being stolen, and diligence is what I am intending to reward. I want very much to encourage you to work together to understand the material, but you will never understand it unless you do the mathematics on your own when it comes time to do it. It is precisely this aspect of copying – the theft of someone else's diligence – that will be a punishable offense.

In a similar vein, you are avoiding Step 1 if you simply copy an answer from the back of the book. Checking those answers is a good idea, but only insofar as it helps you to learn how to do the problem. (If your answer agrees, it is usually a good sign that you can do the problem.) *Be sure to show your work*, and be aware that the answer in the back of the book is not always right!

When you write up your homework, do it on standard $8\frac{1}{2} \times 11$ paper, and keep in mind that it is a document by which you will be judged. Write legibly, spell words correctly, and make your steps clear. Don't reinforce any bad habits that might lead you to sign your name to shoddy work some day when the stakes are higher. Fold the paper vertically, and with the crease on your left (like a book), put your name on the outside of the sheet. Details concerning writing up homework are found in the diagram at the end of this little essay.

Homework is due at the beginning of class. Late homework will be accepted up to seven days late, for a three-point penalty the first day missed, and a one-point penalty for each subsequent day missed. Please keep in mind that the standard for late homework is by *calendar day, not by class day*. Homework missed due to an excused absence can be handed in with a *delayed* penalty: there is a grace period of one day for each day of excused absence, then the penalty begins. Please note that *keeping track of homeworks missed due to absences will be the student's responsibility*.

On most occasions, I will grade one student's paper and then have that student grade the rest of the papers according to that key. Grades will be on a 10-point scale with increments of $\frac{1}{2}$. Students should take this grading responsibility seriously. Remember that this is the best chance for diligence to shine in my grading system, and laziness must not be rewarded. Partial credit may be awarded as the grader sees fit, just so long as it is fair to all.

TESTS

Tests will be designed primarily to test *knowledge*, although *cleverness* is certainly useful, and *diligence* will have played a strong role in how much knowledge was accumulated prior to the test. My intent on tests is to find out what you know and to get you ready for the format and style of the AP Exam. Tests are graded according a standard rubric – a copy of which you will receive – and there is a penalty for guessing on multiple-choice questions.

Because major tests assess *knowledge*, the grades will be curved to reflect how much material the class has actually absorbed. A 90 on an easy test could actually reflect less knowledge than a 70 on a more demanding test, so curving to a subjective "class average" compensates for that. The better the class, the higher the class average; the higher the class average, the better the curve. Students who struggle in a class that is challenged can expect more benefit from my curve than students who are comfortable in a class that is coasting! In terms of *knowledge*, the students in the better class are better off than the students in the lazy class.

There is consequently an important group component to each of my math classes. Each individual's performance is obviously significant, but the "class average" is based on how the class as a whole is doing. Is the class being dragged down by its lowest components, or being elevated by its highest components? Does the class work well together mathematically, or do some students resist work to the point of impeding the efforts of others? Does the class welcome challenges, or seek the path of least resistance? Am I the coach, or am I the enemy? Is it me against you or *us against ignorance?* The class as a whole must make those decisions somehow.

QUIZZES

Quizzes differ from tests in three important ways: (1) they are shorter – usually three to five problems; (2) they concentrate on less material than a test; and (3) they are intended to reward both knowledge and cleverness. This last point is significant philosophically, as it means that quiz questions are not necessarily fair assessments of what a student knows. Knowing the material does not guarantee success.[4] Quiz questions will often require extra thought or insight. On quizzes, such comments as "You tried to trick us!" or "You never showed us anything like that!" or "How do you expect us to answer this if nobody gets it right?" are all irrelevant. What matters is that the question has an answer. If only two students get a quiz question right, don't blame the question; instead, try to be one of those two students next time!

All quizzes will be "partner quizzes" in order to assess your performance in a collaborative setting. Partners will be randomly assigned, and both students in the pair will receive the same score. (Tests will never be collaborative.)

GROUP INVESTIGATIONS

The purpose of the Group Investigations is three-fold: to assess collaboration; to assess cleverness; and to assess your skill at using calculus in an applied situation. The Investigations are to be completed in groups consisting of either three or four persons. The final report and class presentation that presents your solution is the ultimate result of collaboration, knowledge, cleverness, and diligence.

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[4]Although not knowing the material probably guarantees a lack of success!

These Investigations are similar in nature and scope to projects that may be assigned to you by your superiors in your job. In many employment situations, subordinates are asked to solve problems for which they are responsible for researching the problem, planning its solution, executing the solution, and reporting the findings to the superiors. For this assignment, you will be asked to complete a written report of your findings as well as create a presentation.

The report must be an organized and neatly-produced document. Complete sentences, good grammar, proper spelling, and correct mathematics are expected. The presentation must also describe the problem and what must be done to correct it. The report is where all the mathematics goes; the mathematical details do not belong in the presentation.

To help you take full advantage of the Investigations, the following suggestions are offered.

- *Get started immediately!* You will not be able to complete the investigation on a last minute basis. Portions of the project will move slowly and working in a group requires more time due to scheduling difficulties.

- Read over the entire investigation carefully before you begin discussing or completing any portion of it.

- Initially, you may not know how to begin. Don't panic! A discussion with other group members usually generates some ideas.

- The procedure for a complete investigation is not as clear as it is for solving standard homework problems. You will possibly need to make assumptions in order to simplify the problem. Justify these assumptions and comment on how they may or may not affect the final result.

- If any questions persist or there is a lack of clarity on some point, be certain to discuss them with me *before* writing the final report.

THE PROJECT

Due during second semester is a project. The details of the project will be given just before Spring Break, and it will be due the day before the AP Exam.

THE CURVE

The class average is just that: the average of everyone's grades in the class. However, you can raise the class average by exceeding my expectations and can lower the class average by disappointing me, but it is that class average that will determine the scaling of all tests and final exams. The better you are, the more you can expect me to challenge you and the better will be your chances of showing me how high your class average should be.

If a test is especially difficult for a class, then they are protected by the fact that the class average moves sluggishly: say from 85 down to 83. I can understand how an 85 class might become an 83 class in the few weeks between tests, but how could they suddenly plunge to 78, unless at least one of those tests was a faulty indicator of how good that class was? So, let us say that I give a challenging test to a class whose average

stands at 91. They handle the stuff I expect them to handle, and several of them surprise me on the hard ones. They make the usual careless mistakes, but everyone is doing the right kind of mathematics. Grading on an AP scale, I find that the test average is 75. I look back on the homework effort for the past few weeks, the class participation, and so on, and I decide to raise the class average to 92. This gives me an ordered pair $(75, 92)$ for scaling raw grades to real grades. Now suppose that my top student has managed a raw score of 93, some fantastic work, which I decide to scale to 99. That gives me a second ordered pair $(93, 99)$. Those two points determine a linear equation that enables me to scale anyone's grade in a fair and objective manner. Mathematically, the effect of this scaling is to adjust the mean (a primary goal) and to reduce the standard deviation (a secondary effect that helps me accomplish the primary goal of teaching mathematics to my entire class).

For example, let us suppose that this test really catches one student dismally unprepared, for any number of academic or other reasons. Say the student gets a raw score of 20. My scale brings that up to a 71, where it is still an outlier in terms of a much smaller standard deviation, but where the student can still believe that a comeback is possible. Notice that the class average is very significant here; if we change that class average to 82 rather than 92 and leave everything else the same, the raw score of 20 scales to a real score of only 30.

Remember: you and your classmates determine the class average.

EXPECTATIONS

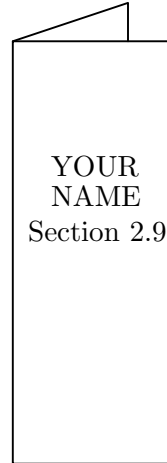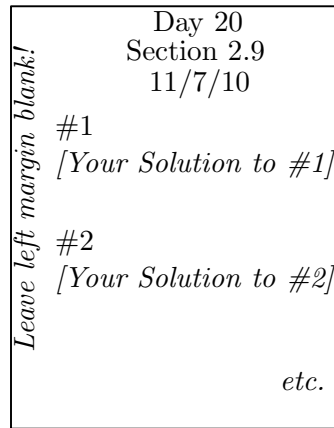Enough about assessment. Now a few brief words about behavior and general expectations.

I can teach you this material. You, however, have to give me the chance to teach it to you. For that reason, your involvement in the class must be total and undivided, and I want you to pin me down with questions when you are confused. If you are not paying attention, you are hurting yourself. If you are distracting others, you are hurting them. If you are distracting me, then you are hurting everybody, and all these distractions affect the class average – which is the key to the curve. Your attitude can actually raise or lower everyone's grade by affecting the curve, and I want you all to FEEL that responsibility for each other's welfare. My grading process, my teaching style, and my entire educational philosophy are based on the premise that learning mathematics is a *group effort.* Colleges and universities owe their very existence to that fundamental premise. Consequently, I consider all incidents of bad classroom behavior to be acts of selfishness more than anything else. Think carefully about the effect you have on the learning of others.

If you ever find yourself falling behind, get extra help! It does not even have to be help from me. *Find a classmate and work together!* If neither one of you can understand something, then you can *both* come to me and we'll help twice as many people.

Don't be absent. It's much easier to be here than to catch up after you have not been here. If you do get sick, leave space in your notebook for each day missed and fill in the gaps when you return.

In your textbook you will find very useful suggestions for studying for a math class such as AP Calculus. It is worth your time to take heed of at least a few of those suggestions.

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                  Day 20
               Section 2.9
                 11/7/10

  #1
  [Your Solution to #1]


  #2
  [Your Solution to #2]


                              etc.
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(vertical text on left margin: *Leave left margin blank!*)

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        YOUR
        NAME
     Section 2.9
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Suggestions for submitting homework

√ Your handwriting should be legible.

√ Homework with multiple pages should be stapled in the upper left-hand corner.

√ In the top center of the first page, you should write the Day number, the assignment (section number and/or problem numbers) and the date it was assigned.

√ Problems should be clearly labeled and numbered on the left side of the page. There should also be a visible separation between problems.

√ You should leave the entire left margin blank so that graders may use this space for scoring and comments.

√ Only write on the front side of the paper, never on the back.

√ To ensure that each problem is graded, problems should be written in the order they are assigned.

√ It is good practice to first work out the solutions to homework problems on scratch paper, and to then neatly write up your solutions. This will help you to turn in a clean finished product.

√ To submit your homework, fold your papers together lengthwise like a book (the first page is on the inside and the last page is the outside) and write your name and the assigned section number clearly on the outside like the title of a book.