Magnet Precalculus Syllabus

Instructor: Dr. Chuck Garner

Office Hours: I have Math Team on Tuesdays and Thursdays after school and on Friday mornings before school. Every other Monday afternoon is a faculty meeting. All other times before or after school are available, but you must give me 24 hours notice.

Text: Michael Sullivan and Michael Sullivan III. *Precalculus: Enhanced with Graphing Utilities*, 4th ed., Pearson Prentice-Hall, 2006. ISBN 0131924966; $144.00

Additional Resource: The Precalculs section of the *Visual Calculus* Web Page.
`http://archives.math.utk.edu/visual.calculus`

Course Description: This is a course in precalculus, designed to prepare students to take college-level calculus. It includes rational, circular, trigonometric, and inverse trigonometric functions; basic trigonometric identities and the laws of sines and cosines; sequences and series; polar and parametric equations; vectors; counting and probability. Also included is an introduction to limits. Students will use a graphing calculator throughout the course to help model and visualize these concepts. It is also a goal of this course that students should develop an interest and appreciation for mathematics itself, outside scientific and technological applications.

Materials:
You will need the following materials daily.

1. a notebook for notes
2. a binder with loose-leaf paper for homework
3. pencils (work to be graded must be in pencil)
4. a graphing calculator (TI-83 or TI-84)
5. the textbook

Requirements:

1. Bring all materials. *Note: I do not provide extra materials if you fail to bring your materials.*
2. Complete all assignments.
3. Use class time constructively.
4. Actively participate in class discussions.
5. A desire to learn and a determination to succeed.

Evaluation:

First Semester.		*Second Semester.*	
Algebra, Graphs, and Functions	430	Applications of Trigonometry	270
Trigonometric Functions	290	Polar, Vectors, Parametrics	340
Analytic Trigonometry	330	Sequences, Counting, Limits	340
Portfolio Checkpoint	50	Portfolio	150
TOTALS:	1100		1100

The total points for each topic will come from various assessments. These assessments are explained on pages 3–6.

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

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

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

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.

Make-Up Work:

Tests No make-up tests will be given unless arrangements are made prior to test day. If a test is missed, the semester exam will be used to replace the missed test. There are no exam exemptions.

Quizzes No make-up quizzes will be given unless arrangements are made prior to the day of the quiz. If a quiz is missed, one-fifth of the next test grade will be used to replace the missed quiz.

Homework No make-up homework assignments will be given.

Extra Credit No extra credit of any kind will be given.

Absences Since nothing can be made-up anyway, it is completely irrelevant whether your 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 diligence 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.

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, challenge problem sets, tests, quizzes, and a portfolio.

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. 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, but it will probably be a source of some of your best *portfolio* items (see below). 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. (See below for more on the curve.)

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:

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 in a forum. 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

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

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.

Some homework will be completed on-line. You will need to following course code to enroll in the online homework:

6th period: `XL00 C17P 901X 7YA3`
8th period: `XL00 C17Q 901X 8YA3`

Some homework will be completed on paper that you will turn in. When you write up these additional problems, 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.

CHALLENGE PROBLEMS

Most assignments are timed, either explicitly (like quizzes) or implicitly (like daily homework). Students are rarely given the opportunity to have the time required to think deeply about mathematical concepts. The Challenge Problem is an attempt to address that shortcoming. Challenge Problems are mathematical queries that require deep thought for the solution. (This is where *cleverness* is assessed.) You will have at least three weeks to complete each Challenge Problem set, and usually you will have longer than three weeks. With such time, I expect you to compose thoughtful, neat, legible, and complete solutions, showing all work.

To aid you, you will again be assessed in a collaborative setting. The Challenge Problem sets must be completed in groups of two or three students. (Turning in solutions to Challenge Problems sets that represent the work of an individual will receive zero points.) You are free to consult other sources to help you solve the problems: the web, your calculator, a tutor, computer software, students in other classes, your mother, a magic genie, or me. (But please be aware that I will only help you up to a point. Begging me for the answer is not a sign of cleverness.) *You are prohibited from consulting another group.*

With all this allowed consultation, how do these assess *your* cleverness? Aren't you just calling upon the cleverness of others? Well, recall that you must write complete solutions that show all work. So even if you get the answer from your calculator, you cannot use it. Simply answering a problem with "I graphed it and pressed trace to get the value" is completely unacceptable. You and your group must find a way to solve each problem that is independent of your calculator, your computer, or others. (This does not mean that you cannot use your calculator to *confirm* your solution.)

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 calculus. 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 (although not knowing the material will probably guarantee a lack of success). 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" 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.) Quizzes are also timed; usually fifteen minutes to complete five problems.

PORTFOLIO

One valid criticism of traditional classroom assessments is that the students themselves have no significant input in determining what will be assessed. Essentially, teachers create the hoops for students to jump through, and students must hope that the hoops will match up well with what they have learned and how they can best communicate it. Portfolio assessment is an attempt to empower the student in his or her own assessment process. There will therefore be a portfolio grade first semester based on a portfolio of work by which you would like to be judged. Here is how it will work.

For your portfolio you must produce several pieces of your own work which you believe describe (positively) your development in this course. These could be based on tests, quizzes, homework, notebook entries, experiences outside of class, or your own feelings. They could take the form of reflective essays, poems, artistic works, or whatever. The important thing is that each portfolio entry should give me evidence of your learning that I otherwise would not have. A perfect quiz, while certainly good evidence of your learning, is not a good portfolio item – because it is evidence that already resides in my grade book. A bad quiz could be a great portfolio item if it is accompanied by a reflective essay on why you did badly, with some proof that you subsequently mastered the material you did not know at the time. I would be glad to discuss any item with you before it goes into the portfolio. (This will provide an occasion for you to explain your selection to me, and for me to react to your choice in your presence.) The Portfolio is not due until the end of second semester, but by the end of first semester, you ought to have at least two items in the portfolio. You will need a minimum of *five* items by the end of the year.

Since the intent of the portfolio is to communicate your learning to me in ways that go beyond what my gradebook already tells me, my assumption will be that the portfolio can only HELP your average, and it will be graded

accordingly. However, if your portfolio is incomplete, missing, or carelessly shoddy, then your *homework* average will be reduced by up to 40 points for showing lack of diligence.

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 your chances are 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 the test out of 100 raw points, 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.

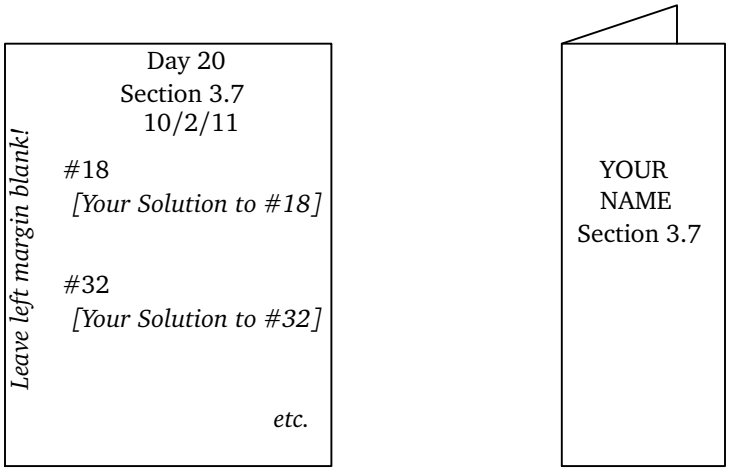
I can teach you this material. You, however, have to give me the chance to teach it to you. For that reason, your involvement in the class must be total and undivided, and I want you to pin me down with questions when you are confused. If you are not paying attention, you are hurting yourself. If you 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.

Here are some suggestions concerning writing up homework.

- Your handwriting should be legible.
- 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 (do *not* write the due date).
- 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.



Magnet Precalculus Schedule

First Semester

Day **The Day's Topic** (Numbers in parentheses are the corresponding textbook sections)
The Day's Assignment (A string of numbers indicates problems from that textbook section)

1 Intro

2 Lines and Graphs
Worksheet

3 Exponents and Graphs
Worksheet

4 Factoring
Worksheet

5 Simplifying and Expanding
Worksheet

6 Exponentials and Logarithms
Worksheet

7 Quiz; Equations
Worksheet

8 Transformations (2.6)
44, 46, 52, 54, 58, 66, 70, 74, 89

9 Factoring Part II
Worksheet

10 Quiz; Average Rates of Change
Worksheet

11 Rational Functions (3.3, 3.4)
On-Line

12 Inequalities (3.5)
On-Line

13 Piecewise Functions (2.5)
On-Line

14 Quiz; Composite Functions (4.1)
On-Line

15 Angles (5.1)
On-Line

16 Angles and Motion (5.1)
72, 76, 80, 86, 90, 92, 96, 98, 108, 110

17 Quiz; Test Prep
Worksheet

18 TEST

19 CP Set 1 due; The Unit Circle (5.2)
On-Line

20 Trigonometric Properties (5.3)
On-Line

21 Trigonometric Values (5.3)
On-Line

22 Quiz; Graphs of Sine and Cosine (5.4)
38, 40, 44, 46, 48, 52, 62, 64, 70, 72, 74

23 Phase Shifts (5.6)
4, 6, 10, 12, 14, 16, 18

24 Graphs of Other Trig Functions (5.5)
26, 28, 30, 34, 38, 40, 42

25 Applications of Trig Functions (5.2–5.5)
5.2: 116, 118, 120; 5.3: 120; 5.4: 90, 92; 5.5: 46; 5.6: 20, 26

26 Quiz; Test Prep
Chapter 5 Test, 1–30, pp. 443–444

27 TEST

28 CP Set 2 due; Inverse Trig Functions I (6.1)
On-Line

29 Inverse Trig Functions II (6.2)
On-Line

30 Basic Trigonometric Identities I (6.3)
On-Line

31 Quiz; Basic Trigonometric Identities II (6.3)
On-Line

32 Sum and Difference Identities (6.4)
On-Line

33 Quiz; Double and Half Angle Identities (6.5)
On-Line

34 Applications Using Identities (6.1, 6.4, 6.5)
6.1: 58, 60, 64; 6.4: 93; 6.5: 76, 78, 80, 83

35 Quiz; Test Prep
Chapter 6 Test, 1–22, p. 514

36 TEST

37 CP Set 3 due; Exam Prep

38 Exam Prep

Magnet Precalculus Schedule

Second Semester

Day **The Day's Topic** (Numbers in parentheses are the corresponding textbook sections)
The Day's Assignment (A string of numbers indicates problems from that textbook section)

39 Trigonometric Equations I (6.7)
On-Line

40 Trigonometric Equations II (6.8)
On-Line

41 Right Triangle Trigonometry (7.1)
On-Line

42 Quiz; Applications of Trig (6.7, 6.8, 7.1)
6.7: 58, 60; 6.8: 65, 66, 69;
7.1: 50, 52, 56, 60, 64, 72

43 The Law of Sines (7.2)
On-Line

44 The Law of Cosines (7.3)
On-Line

45 Quiz; Areas (7.4)
On-Line

46 Test Prep
Chapter 7 Test, 1–17, pp. 568-569

47 TEST

48 CP Set 4 due; Polar Coordinates (8.1)
On-Line

49 Polar Graphs I (8.2)
On-Line

50 Quiz; Polar Graphs II (8.2)
44, 50, 52, 58, 64, 66, 72, 74

51 Complex Numbers (8.3)
On-Line

52 DeMoivre's Theorem (8.3)
42, 46, 48, 52, 54, 56, 60

53 Planar Vectors (8.4)
On-Line

54 Quiz; The Dot Product (8.5)
On-Line

55 Applications of Vectors (8.4, 8.5)
8.4: 64, 66, 68; 8.5: 18, 26, 30, 32, 36

56 Three-Dimensional Vectors (8.6)
On-Line

57 Quiz; The Cross Product (8.7)
On-Line

58 Parametric Equations (9.7)
On-Line

59 Graphs of Parametric Equations (9.7)
44, 50, 52, 56, 58, 60

60 Test Prep
Chapter 8 Test, 1–7, 10–26, p. 649, and
64, 66, 83, pp. 721–722

61 TEST

62 CP Set 5 due; Sequences (11.1)
On-Line

63 Quiz; Arithmetic Sequences and Series (11.2)
On-Line

64 Geometric Sequences and Series (11.3)
On-Line

65 Applications of Seq's and Series (11.1–11.3)
11.1: 84, 86, 90; 11.2: 50, 52, 54;
11.3: 66, 68, 70, 74

66 Counting (12.1)
On-Line

67 Quiz; Permutations and Combinations (12.2)
On-Line

68 Probability (12.3)
On-Line

69 Limits by Graphs and Tables (13.1)
On-Line

70 Limits Algebraically (13.2)
On-Line

71 Quiz; One-Sided Limits (13.3)
48–60 even, 66, 70, 72, 78, 80

72 Test Prep
Chapter 11 Test, 1–13, 16, 17, pp. 872–873
Chapter 12 Test, 1–10, 14–19, 21, p. 907
Chapter 13 Test, 1–13, p. 949

73 TEST

74 CP Set 6 due; Exam Prep

75 Portfolio due; Exam Prep

76 Exam Prep

FIRST SEMESTER

HOMEWORK (each out of 10)

Section	Date	Grade	Section	Date	Grade

CHALLENGE PROBLEMS (each out of 50)

CPS	Date	Grade	CPS	Date	Grade

QUIZZES (each out of 20)

Day	Date	Grade	Day	Date	Grade

TESTS (each out of 100)

Test	Date	Grade	Test	Date	Grade

PORTFOLIO CHECKPOINT (out of 50):

SECOND SEMESTER

HOMEWORK (each out of 10)

Section	Date	Grade	Section	Date	Grade

CHALLENGE PROBLEMS (each out of 50)

CPS	Date	Grade	CPS	Date	Grade

QUIZZES (each out of 20)

Day	Date	Grade	Day	Date	Grade

TESTS (each out of 100)

Test	Date	Grade	Test	Date	Grade

PORTFOLIO (out of 150):