

City of Seattle Upward Bound @ Seattle University, Summer 2018

Course: Calculus

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Course Summary:

- This six-week course is designed to teach the concepts necessary for success in a year-long high school Precalculus class using the application of critical thinking skills, active learning, cooperative learning, real-life applications, one-on-one assistance, and a culminating project. There are no Common Core Standards for Precalculus, but this course builds further upon the Common Core State Standards, Mathematics Content Focus Algebra II.
- Topics covered include limits, continuity, derivatives, applications of derivatives, analysis of graphs, and an introduction to integrals.

Resources:

- *Calculus of a Single Variable* (11th ed), Cengage Learning, Larson & Edwards, 2017.
- *Calculus* (8th ed), Cengage Learning, Stewart, 2016.
- ixl.com
- khanacademy.org
- math.com
- tutorial.math.lamar.edu

Structure of Daily Lessons:

- Each day of class students will split into synergy groups to work on the lesson of the day. Lessons are divided into Basic, Intermediate, and Advanced sections. Depending on group performance and class time, some days we may only complete the Basic section while others we may finish most of the Advanced section.
- Each group will be asked to have a student present a few of the problems that they complete to the whole class. Students who finish work early are encouraged to help each other and in turn gain an even stronger understanding themselves. Think win-win.
- The Basic section of each lesson must always be completed (and this will be checked for a grade), but if Intermediate or Advanced sections are left unfinished it is up to the student to be proactive and choose to sharpen the saw. Files will be posted at alexthayer.net/ub/calc/ for students wishing to check their understanding.
- There are 20 planned daily lessons. If field trips or other events prevent us from getting to all of them, we may omit one or more of them. If we have extra class days, they may be used for continued work on Intermediate and Advanced sections students have not completed.

List of Planned Lessons:

1. Function Notation
2. Linear, Quadratic, and Polynomial Functions
3. Rational Functions
4. Other Types of Functions
5. Introduction to Limits
6. Estimating Limits
7. Methods for Finding Limits
8. Continuity
9. Extreme and Intermediate Value Theorems
10. Introduction to Derivatives
11. Derivative Rules: The Power Rule
12. Derivative Rules: Sums, Differences, and Constant Multiples
13. Analyzing Functions using Derivatives
14. Derivative Rules: Products and Quotients
15. Derivative Rules: Exponential, Trig, and Log Functions
16. Derivative Rules: The Chain Rule
17. The Second Derivative and Concavity
18. Mean Value Theorem
19. Related Rates and Implicit Differentiation
20. Introduction to Integration

College Board AP Standards (Effective Fall 2016):

- **Limits**
 - LO1.1A(a): Express limits symbolically using correct notation.
 - LO1.1A(b): Interpret limits expressed symbolically.
 - LO1.1B: Estimate limits of functions.
 - LO1.1C: Determine limits of functions.
 - LO1.1D: Deduce and interpret behavior of functions using limits.
 - LO1.2A: Analyze functions for intervals of continuity or points of discontinuity.
 - LO1.2B: Determine the applicability of important calculus theorems using continuity.
- **Derivatives**
 - LO2.1A: Identify the derivative of a function as the limit of a difference quotient.
 - LO2.1B: Estimate derivatives.
 - LO2.1C: Calculate derivatives.
 - LO2.1D: Determine higher order derivatives.
 - LO2.2A: Use derivatives to analyze properties of a function.
 - LO2.2B: Recognize the connection between differentiability and continuity.
 - LO2.3A: Interpret the meaning of a derivative within a problem.
 - LO2.3B: Solve problems involving the slope of a tangent line.
 - LO2.3C(1-3): Solve problems involving related rates and rectilinear motion.
 - LO2.3D: Solve problems involving rates of change in applied contexts.
 - LO2.4A: Apply the Mean Value Theorem to describe the behavior of a function over an interval.

- **Integrals**

- LO3.1A: Recognize antiderivatives of basic functions.
- LO3.2A(a): Interpret the definite integral as the limit of a Riemann sum.
- LO3.2A(b): Express the limit of a Riemann sum in integral notation.
- LO3.2B: Approximate a definite integral.
- LO3.2C: Calculate a definite integral using areas and properties of definite integrals.
- LO3.3B(b): Evaluate definite integrals.

Grading System:

- **Basic Daily Lessons (25%)**

- You are expected to show me that you have completed the Basic section of each day's lesson within a timely manner. If you expect to be absent, please plan in advance to complete the worksheet.
- While group work is expected, you should ensure that you are not merely copying from someone else or letting someone copy from you. The goal is to understand the lesson so that you are prepared for your coming year of school.
- 2 out of 2 points for completing a basic lesson; only 1 point for partial completion

- **Participation (25%)**

- You are encouraged to help everyone in your group get through the worksheet.
- Do not use phones or headphones during class as they are a distraction.
- Everyone begins a class day with 2 participation points but may lose 1 or both if they are off-task or otherwise disrupt learning.

- **Quizzes (25%)**

- There will be several short quizzes throughout the summer. They will be taken during the first 10 minutes of class, so please arrive on-time every day.
- Each quiz will consist of only 2 questions: a concept question and an example.
- For the concept question, you will be asked to give a mathematically accurate explanation for how something works. For example, "explain how to multiply two linear binomials". This question will be worth 4 points.
- The example question is more like a traditional math problem, and it will relate to what you were asked to explain in the concept question. It will be worth 6 points.
- If you would like to re-take a quiz, please let me know. You may arrange to re-take it on another date (as long as we don't have another quiz scheduled for that date). Example problems will be different from originals on re-takes.

- **Culminating Project (25%)**

- The culminating project for this course will be an analysis of a function with a real-life context. You will locate and give meaning to all important points on the graph.
- There should be both a physical project (to display at the banquet at the end of the summer) and a speech (for which you may use the board or a projector as an aid).
- A list of functions and their corresponding real-life scenarios will be posted on my website by about halfway into the summer. At this point I will also pass out a copy of the rubric along with a shorter form list of the functions.
- We will use a computer lab for 1-2 class periods toward the end of the summer so that everyone can type their analysis and print it in a professional-looking way.

Your final average will be rounded to the nearest integer percentage and assigned a letter grade according to the following scale:

	A = 93 – 100	A- = 90 – 92
B+ = 87 – 89	B = 83 – 86	B- = 80 – 82
C+ = 77 – 79	C = 73 – 76	C- = 70 – 72
D+ = 67 – 69	D = 63 – 66	D- = 60 – 62
	F = 0 – 59	

Integration of 7 Habits:

- **Be proactive** in studying and asking questions.
- **Begin with the end in mind** that you will succeed in your next math course when you return to school in the fall.
- **Put first things first** when rationing time between studying and other activities.
- **Think Win-Win** and cement your own understanding of math by helping others.
- **Seek first to understand** what the lesson or another student is explaining before composing your own response to that topic.
- **Synergize** with your classmates and solve math problems together.
- **Sharpen the saw** by taking advantage of the Intermediate and Advanced sections of each lesson and preparing yourself even better for the year ahead.

Homework:

As mentioned above in the Grading System, there is nothing specifically called “Homework”, but you are expected to complete the Basic Daily Lessons, fully participate in class, prepare yourself for quizzes, and complete and present your final project.

Absences and Late Assignments:

If you are absent, you must be given the same number of days you were gone from school to turn in missing work for full credit. Assignments completed later than this time must be accepted at 50% credit. If you missed or expect to be missing class, I encourage you to contact me by e-mail and check the website for any new files.