UNO CALCULUS I– MATH 1950
(Fulfills AP Calculus AB Credit in High School)

This UNO course has been approved by UNO faculty to be offered for dual credit, and this syllabus meets disciplinary outcomes as reflected in UNO's master syllabus. ***Students must submit a dual credit application and meet all registration, academic, and other institutional requirements according to established deadlines in order to receive UNO course credit.*** Please visit dualenroll.unomaha.edu for additional information.

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Course Title: Calculus I

Semester or Year: 2023-24

Textbook: <u>Calculus</u>, 3rd Edition, Sullivan, Miranda

Course Schedule: Alternating Block Schedule (90 minutes of instruction every other day)

General Philosophy: Throughout the year, as we encounter each topic, we look at each topic in various ways. Among these ways are graphical, numerical, analytical, and verbal. Examples of problems using each of these approaches are exhibited in lectures, and students are asked to practice problems that require them to look at the topics from these multiple approaches. When possible, problems are solved using more than one approach and solutions are compared and connections among the representations are demonstrated. Assessments include a variety of problems that require the student to demonstrate their understanding and ability to use these multiple approaches.

Graphs of all types (function, parametric, polar, sequence, slope fields) are produced both by hand and with the graphing calculator to assist in the understanding and solving of problems. Special emphasis is placed on the interpretation of antiderivatives and derivatives of a function from a given graph.

Numerical solutions are found both with a calculator and manually. The students are encouraged to check the reasonableness of their numerical solution by comparing the solution to that obtained by other approaches when possible.

Students use analytic techniques to solve applied problems in differential and integral calculus. Discussions are had where students consider what types of other non-traditional problems to which these techniques can be applied.

Students are asked to explain calculus problems in writing and also verbally. Emphasis is placed on the fact that it is not just the final answer that is important, but that the justification of the steps involved is just as important. They must be able to justify all the steps that lead to the final answer. Students are asked to orally demonstrate their knowledge of a concept by presenting problem solutions to the class and small groups. In addition to meeting all curricular requirements of the UNO course, this course also meets the requirements of the advanced placement exam.

Content and Pacing:
Chapter P – Preparation for Calculus:
Individual work – time will vary depending on student readiness
Solving equations and inequalities, review of linear equations (slope as a rate of change, intercepts), functions (domain, range, symmetry, transformations, compositions, polynomials, rational functions) and review of Trigonometry topics (domain, range, and graphs of the six trigonometric functions and their inverses. Amplitude, period, and phase shift, simple harmonic motion.)

Chapter 1 – Limits and Their Properties:
3 weeks
Evaluating two-sided limits, one-sided limits, and infinite limits numerically, algebraically, and graphically.

Chapter 2 - Differentiation:
3.5 weeks
Instantaneous velocity and slope of a tangent line using limits. Limit definition of the derivative. Short cut rules for derivatives including power rule, sum and difference rule, scalar multiple rule, product rule, quotient rule, chain rule and the derivative of the six trigonometric functions. Implicit differentiation.

Chapter 3 – Applications of Differentiation:
4 weeks
Local minimums and maximums, global minimums, and maximums, increasing and decreasing functions using the first derivative, concavity of functions using the second derivative (the second derivative as a rate of change of the first derivative), using calculus to graph, Mean Value Theorem. Word Problems involving Derivatives including related rates, optimization, and estimation using tangent lines and differentials.

Chapter 4 - Integration:
3 weeks
Antiderivatives. Estimating the area on an interval under a curve and over the x-axis using rectangles (using a table or a TI-89), definition of the definite integral as a limit of a Riemann Sum, properties of the definite integral. The Fundamental Theorem of Calculus, integration by substitution, numerical integration (trapezoid rule, Simpson's rule).

Chapter 5 – Logarithmic, Exponential, and Other Transcendental Functions:
4 weeks
Definition of the natural logarithmic function, derivatives and antiderivatives involving the natural logarithmic function. Definition of the exponential function as the inverse of the natural logarithmic function, derivatives and antiderivatives involving the exponential function. Derivatives and antiderivatives involving other logarithmic and exponential bases. Derivatives and antiderivatives involving the inverse trigonometric functions. Solving differential equations, applications of differential equations, slope fields.

Chapter 7 – Applications of Integration:
6 weeks
Geometric applications of the integral: area between two curves, volume of rotation by the disk method, volume of rotation by the shell method, volume by slicing, arc length, surface area of solids formed by rotation, centroids. Physics applications of the integral: work, center of mass, fluid pressure, fluid force.

Chapter 8 – Basic Integration Techniques
2 Days

AP Review (2 weeks)

AP Exam

Topics
Remainder of semester
Section 8.7 L'Hôpital's Rule
Section 8.2 Integration by Parts
Section 5.8 Hyperbolic Functions

Type of Assignments: A test will be given over each unit. Daily quizzes will be given over the material from the previous class. Practice assignments will be given each day.

Class Policies:

- ✓ Late Work: Work for a particular unit will not be accepted after the unit test.
- ✓ Class Participation: Students are expected to contribute to class discussions and work problems in class.
- ✓ Attendance: Students with more that 5 absences will be placed in failing status and must complete a grade appeal to obtain credit.
- ✓ Make-up work procedure: Students that are absent should see the teacher to obtain missing assignments and notes. If a student has an excused absence on the day of a test or quiz, the student will have one week to come in before or after school to make up the test or quiz. Unexcused absences result in a 0 for the test or quiz.
- ✓ Passes: Passes will be issued only in an emergency. Passes will be issued only to students that have their North High I.D.

Statement of Academic Integrity: Students are expected to do their own work. Stuents caught copying or cheating will receive a 0.

Classroom Guidelines:

    -Have respect for everyone in the room. Do not talk when someone else is presenting to the class, which includes both teacher and students.

    -Be prepared when the bell rings. (That includes having completed your previous assignment.)

    -Ask questions!

    -Help others when they are struggling.

    -Only move throughout the room during work time, group projects, or with permission. (In-person instruction)

    -You are expected to be working on Math until the last minute of class.

    -Only request a pass at a time when you are not interrupting the class. (For in-person instruction)

    -Keep distractions to a minimum!

District Stuff:

Assessment (customized according to subject area – examples below)

- Course grades will be determined by planned assessments such as tests, quizzes, and projects scored with rubrics.
- Major tests and/or writing projects are to be expected at the end of each major unit outlined above.

State Testing: As per the requirements of the NCLB, all 11th-grade students are required to complete the Nebraska State writing (NeSA-W) and reading (NeSA-R) tests. The NeSA-W is usually administered during the month of February, and the NeSA-R is usually administered during the month of April.

District Testing:

- o In order to prepare students for the NeSA-W test, OPS requires all English 5-6 students to complete one formal writing assessment during first semester, to be submitted to and scored by the district. Students will receive this assessment back, to chart their progress and as feedback to improve their writing.
- o In order to prepare students for the NeSA-R test, OPS requires all English 5-6 students to complete an online reading assessment, to determine their strengths and weaknesses and help them improve their reading comprehension skills.
- o In order to measure student progress in grammar, OPS requires all students to complete a short grammar assessment at the end of each semester.

OPS Secondary Grading Practices*

All coursework and assessments are judged based on the level of student learning from "below basic" to "advanced." This course will provide multiple opportunities to achieve at the "proficient" to "advanced" levels. Students are evaluated based on a proficiency scale or project rubric. Proficiency scales for this course are available upon request (teacher will

identify location such as portal, teacher website, attached, etc.)

There are three types of coursework*
- *Practice* **–** assignments are brief and done at the beginning of learning to gain initial content (e.g., student responses on white boards, a valid sampling of math problems, keyboarding exercises, and diagramming sentences, checking and recording resting heart rate). Practice assignments are not generally graded for accuracy (descriptive feedback will be provided in class) and are not a part of the grade. Teachers may keep track of practice work to check for completion and students could also track their practice work. Practice work is at the student's instructional level and may only include Basic (2) level questions.

- *Formative (35% of the final grade)* **–** assessments/assignments occur during learning to inform and improve instruction. They are minor assignments (e.g., a three paragraph essay, written responses to guiding questions over an assigned reading, completion of a comparison contrast matrix). Formative assignments are graded for accuracy and descriptive feedback is provided. Formative work may be at the student's instructional level or at the level of the content standard. Formative assessments/assignments will have all levels of learning – Basic (2), Proficient (3), and Advanced (4), which means that for every formative assessment/assignment, students will be able to earn an Advanced (4). Teachers will require students to redo work that is not of high quality to ensure rigor and high expectations. The students score on a formative assessment that was redone will be their final score.

- *Summative (65% of the final grade)* – assessments/assignments are major end of learning unit tests or projects used to determine mastery of content or skill (e.g., a research paper, an oral report with a power point, major unit test, and science fair project). Summative assignments are graded for accuracy. Summative assignments assess the student's progress on grade level standards and may not be written at the student's instructional level. Summative assessments/assignments will have all levels of learning – Basic (2), Proficient (3), and Advanced (4), which means that for every formative assessment/assignment students, will be able to earn an advanced (4).

To maintain alignment of coursework to content standards, which is a key best practice for standards-based grading, teachers will utilize a standardized naming convention for each of the standards within a course. The content standard will be marked on each assignment entered into Infinite Campus (District Grading Program) using all capital letters followed by a colon. After the colon will be the title of the coursework.

At the end of the grading period, scores are converted to a letter grade using this grading scale.

A = 3.26– 4.00
B = 2.51 – 3.25
C = 1.76 – 2.50
D = 1.01 - 1.75
F = 0.00 – 1.00

Redoing/Revising Student Coursework*
1. Students are responsible for completing all coursework and assessments as assigned.
2. Students will be allowed redos and revisions of coursework for full credit as long as they are turned in during that unit of study while a student still has an opportunity to benefit from the learning. When time permits, teachers should allow the redoing or revising of summative assessments.
3. Students are expected to complete assessments when given to the class, or if a student was justifiably absent, at a time designated by the teacher.
4. Redoing, retaking or revising will be done at teacher discretion in consultation with the student and parent(s). Teachers may schedule students before, during, or after school to address needed areas of improvement if not

convenient during class. The time and location for redoing, retaking or revising will be done at the teacher's discretion in consultation with the student and parent(s).

5. Scores for student work after retaking, revising or redoing will not be averaged with the first attempt at coursework but will replace the original score.

Academic Integrity: "*The maintenance of academic honesty and integrity is a vital concern of the University community. Any student found responsible for violating the policy on Academic Integrity shall be subject to both academic and disciplinary sanctions.*" Via studentlife.unomaha.edu/integrity