MEDFORD HIGH SCHOOL
COURSE SYLLABUS

Department: Mathematics
Course Title: Calculus
Level and/or Grade: Honors; Grade 12
Prerequisite: B- or better in Standard Pre-calculus or C- or better in Honors Pre-calculus

Course Description:
This course provides an introduction to many of the concepts found in a first-year college course in calculus, and is designed for students who are not planning on taking the AP Calculus exam. A theoretical foundation is laid through the treatment of limits and continuity. Emphasis is placed upon problem solving, reasoning, communication, connections, and representations, and an understanding of the underlying principles of the calculus rather than on memorizing formulas. Other topics include derivatives, integration, sequences, curves, and vectors.

Learning Standards: Through communication, representation, reasoning, making connections, and problem solving, students will be able to...

I. Functions, Graphs, and Limits:
- Solve a variety of equations involving functions using graphical, numerical, analytical, or verbal methods; describe and analyze graphs using technology.
- Understand, calculate, and estimate limits from graphs or tables of data.
- Understand and describe asymptotic behaviors in terms of limits involving infinity; compare relative magnitudes of functions and their rates of change (e.g. contrasting exponential, polynomial, and logarithmic growth).
- Develop an intuitive understanding of continuity, and understand continuity in terms of limits.
- Develop a geometric understanding of graphs of continuous functions (Intermediate Value Theorem and Extreme Value Theorem).

II. Derivatives:
- Understand and develop the concepts of derivatives; define and interpret derivatives presented graphically, numerically, and analytically.
- Interpret derivatives as instantaneous rates of change.
- Define derivative as the limit of the difference quotient.
- Understand the relationship between differentiability and continuity.
- Understand the concept of the Mean Value Theorem and its geometric consequences.
- Discover the corresponding characteristics of graphs of f, f', and f''.
- Understand the relationship between the increasing and decreasing behavior of f and the sign of f'.
- Understand the relationship between the concavity of f and the sign of f''.
- Understand the concept of inflection points.
- Demonstrate an understanding of the relationship between the derivative and the definite integral.
- Solve related rate problems including velocity, speed, and acceleration, derivatives of inverse functions, and geometric interpretations.
- Understand the basic rules of computing derivatives.
- Interpret differential equations geometrically; understand the relationship between slope fields and solution curves for differential equations.

III. Integrals:
- Identify and understand the meaning of the definite integral both as a limit of Riemann sums and as the
- net accumulation of change; solve authentic problems involving integrals.
- Apply the Fundamental Theorem of Calculus.
- Understand techniques and applications of antidifferentiation.
- Understand the concept of the Reimann sum; use the Reimann sum and trapezoidal sum to approximate definite integrals of functions represented algebraically, graphically, and by tables of values.
- Understand properties of definite integrals and their interpretations.

**Course Alignment with 21st Century Learning Expectations:**

Students will…

1. Become self-directed learners as they
   - Set goals and responsibility for learning.
   - Select strategies for problem solving.
   - Monitor one’s own learning through reflection.

2. Communicate effectively as they
   - Express ideas precisely and with coherence.
   - Use a variety of representations to express mathematics to multiple audiences.
   - Use appropriate vocabulary and symbolic notation effectively.

3. Apply problem-solving skills and critical and creative thinking as they
   - Apply mathematical knowledge to new, non-routine situations.
   - Evaluate and test different routes to solving a problem.
   - Demonstrate persistence.

4. Use technology appropriately as a tool for learning, collaboration, presentation, research, and design as they
   - Demonstrate proficiency with the graphing calculator as a tool for learning.
   - Communicate and collaborate with educators and peers using online systems.
   - Use technology strategically for independent learning, calculation and representation.

5. Act with integrity, respect and responsibility toward themselves, others, and the environment as they
   - Actively participate in class and demonstrates respectful behavior.
   - Respond to new and diverse perspectives.
   - Critique the work of others and accept the critique of others.

6. Exhibit flexibility and adaptability as they
   - Recognize mistakes as an essential part of learning.
   - Revise thinking to apply in context.
   - Approach new experiences with confidence.

7. Collaborate in diverse groups to share knowledge, build consensus, and achieve goals as they
   - Work in pairs and small groups to discuss and problem solve.
   - Construct team positive interactions.
   - Discuss a variety of viewpoints and demonstrate logical reasoning to make decisions.

8. Practice leadership in and service to their community as they
   - Support their peers in learning mathematics.
   - Participate in departmental activities that promote the understanding mathematics.
   - Use mathematical models to solve community problems.

9. Become contributing citizens in a global society as they
   - Understand the role of mathematics in shaping the world.
   - Exchange ideas and resources beyond the classroom.
   - Make career choices that positively impact future of the mathematical learning.

**Assessment:**

- See attached grading policy.