MEDFORD HIGH SCHOOL
COURSE SYLLABUS

Department: Mathematics
Course Title: PreCalculus
Level and/or Grade: Honors/Grade 11/12
Prerequisite: A- or better in Standard Algebra 2 or B in Honors Algebra 2

Course Description:
This course presents a comprehensive study of elementary functions. Emphasis is focused on working with complex numbers; achieving a deeper understanding of exponential and logarithmic functions; interpreting the graphs of polynomial and rational functions; and performing operations with vectors. Additional topics include mathematical induction, sequences and series, data distributions and probability topics. Students are expected to demonstrate depth of understanding, conceptual reasoning and fluency with technology applications.

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

Mathematical Practice:
- Make sense of problems and persevere in solving them.
- Reason abstractly and quantitatively.
- Construct viable arguments and critique the reasoning of others.
- Model with mathematics.
- Use appropriate tools strategically.
- Attend to precision.
- Look for and make use of structure.
- Look for and express regularity in repeated reasoning.

Number and Quantity:
- Perform arithmetic operations with complex numbers.
- Represent complex numbers and operations in the plane.
- Use complex numbers in polynomial identities and equations.
- Represent and model with vector quantities.
- Perform operations on vectors.
- Perform operations on matrices.
- Use matrices in applications.

Algebra:
- Use polynomial identities to solve problems.
- Know and apply the Binomial Theorem.
- Rewrite rational expressions.
- Solve systems of equations.

Functions:
- Graph functions by hand that expressed symbolically and identify zeros, asymptotes when appropriate and show end-behavior.
- Use technology to graph complicated functions.
- Build a function that models a relationship between two quantities.
- Find inverse functions; understand the relationship between exponents and logarithms.
- Extend the domain of trigonometric functions using the unit circle.
- Model periodic phenomena with trigonometric functions.
- Prove and apply trigonometric identities to solve problems.

**Geometry:**
- Apply trigonometry to general triangles.
- Understand and apply theorems about circles.
- Prove the Laws of Sines and Cosines and apply to find unknown measures in right and non-right triangles.
- Translate between the geometric description and the equation for the conic section.
- Use equations and graphs of conic sections to solve real-world problems.
- Give informal arguments for the formulas for the volume of a sphere and other solid figures using Cavalieri's principal.
- Visualize relationships between two-dimensional and three-dimensional objects. By identifying cross-sections and objects generated by rotations of two-dimensional objects.

*from the 2011 Massachusetts Curriculum Framework for Mathematics*

**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.