MEDFORD HIGH SCHOOL
COURSE SYLLABUS

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

Course Description:

This course reviews linear, quadratic, exponential, logarithmic, polynomial and rational 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.

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 function.
- 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.
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.