## **Course Name: Calculus**

## Course Code: H2412 Grade: 12 Level: Academic Year: 5X Credits: 5

**Course Description:** The purpose of this course is to provide an understanding of differential calculus and an introduction to integral calculus as a firm basis for success in college calculus. Analytic geometry and trigonometry are reviewed and used in the solutions of problems. Concepts about limits are used extensively and a wide variety of applications are explored to demonstrate the power of the calculus.

### Prerequisite: Math Analysis

**Course Proficiencies:** The following is a list of the proficiencies students are expected to know and be able to do as a result of successfully completing this course. The proficiencies are the basis of the assessment of student achievement. The learner will demonstrate the ability to:

- 1. Graph functions and apply properties of graphs including intercepts, symmetry, and asymptotic behavior. *1.1D1*
- 2. Apply the concepts and properties of limits to specific functions; apply the limit concept to functions involving sums, products, and quotients. *1.1C1*
- 3. Interpret the limit concept in special circumstances such as one-sided limits, limits at infinity, non-existent limits, and infinite limits. *1.1A2*, *1.1A3*
- 4. Apply and interpret the concept of continuity for specific functions and relate continuity to the behavior of function graphs; relate the concept of continuity to absolute extrema; apply the Intermediate Value Theorem. *1.2A1*
- 5. Apply the definition of a derivative to specific functions. 2.1C1
- 6. Apply differentiation rules and formulas (including the chain rule) to polynomials, trigonometric functions, rational functions, implicitly defined functions, inverses of functions, logarithmic and exponential functions, and composite functions. 2.1C2, 2.1C4
- 7. Determine and apply higher order derivatives. *2.1D1*
- 8. Apply the principal theorems concerning derivatives and differentiation including the relation between differentiability and continuity and the Mean Value Theorem. *2.4A1*
- 9. Utilize derivatives to find and describe function graphs to include: the slope of a curve (using tangent and normal lines), whether a function is increasing or decreasing, the identification of critical numbers, the concavity of a function graph, and the identification of inflection points. 2.2A1, 2.2A2
- 10. Apply derivatives to solve optimization problems (including relative and absolute maxima and minima as well as extreme value problems). *2.3C3*
- 11. Apply derivatives to solve problems that involve rates of change including average and instantaneous rates, related rates, and specific applications (such as velocity and acceleration and supply and demand functions). *2.3C2*
- 12. Apply the definition of the antiderivative to specific functions. *3.1A1*

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#### Calculus Proficiencies – cont'd.

- 13. Apply basic integration formulas to functions previously encountered; use integration by substitution.
- 14. Apply indefinite integration to solve application problems (such as finding distance and velocity from acceleration, Apply the definition and the properties of the definite integral. *3.4C1*
- 15. Utilize approximation to the definite integral including rectangles, trapezoids, and parabolas. *3.2B1*, *3.2C1*
- 16. Apply the fundamental theorems of the definite integral. *3.4B1*
- 17. Apply definite integrals to find areas under and between curves, average value of a function on an interval, volumes of solids. (using disks, washers.) **3.4D2**
- 18. Apply mathematics in practical situations and in other disciplines.
- 19. Use critical thinking skills to make sense of problems, solve them, and communicate processes. *CRP 2, 4 & 8.*
- 20. Use technology to gather, analyze, and communicate mathematical information. *8.1.12.A.3, 8.1.12.C.1*

**Assessment:** Evaluation of student achievement in this course will be based on the following: Evaluation of student achievement in this course will be based on the following:

- A. <u>Tests</u> are usually given at the end of a unit. These generally require a full period to complete. Quizzes and other short assessments are utilized to formatively assess students.
- B. <u>Classwork</u>, evidenced by completed and carefully presented daily work and by the meeting of daily responsibilities, is an essential part of learning. The day-to-day work included as classwork may involve quizzes, the written results of learning activities, graded homework, and assessments of learning observed during class. The more a student is involved, the more learning that takes place.
- C. Homework assignments are given so that students may practice and reflect on their own understanding of the key concepts and applications.
- D. <u>Folders/Notebooks</u> must be maintained by students. These typically include notes and assignments kept in an organized fashion.

# **Board Adopted Materials:**

Teaching Resources and Related Student Materials:

Textbook: CK-12 Calculus (online textbook) Author: Fan, Cifarelli, Almukkahal & Jarvis Publisher: CK-12 Foundation Copyright: 2015