

The Dragon Academy ~ Course Syllabus 2007-2008

FORM 5 ~ Calculus and Vectors **Instructor: Mr. Russo/ Mr. Geraci – MCV4U**

Course Description/Rationale

This course gives students a thorough knowledge of all the topics and tools of elementary calculus and linear algebra. Students will investigate and apply the concepts of limits, differentiation, and integration to polynomial, rational, radical and transcendental functions. All of the basic tools of elementary linear algebra are studied including vectors, matrices and fundamental matrix operations. Students will apply the tools of differential and integral calculus and linear algebra to problem solving in a range of applications. This course is intended to prepare students for the challenges of university level math while giving them experience with exciting and satisfying fields of mathematics. Throughout the course students will be encouraged to contemplate the philosophical nature and cultural relevance of mathematics and logical thinking.

Unit	Unit Title	<i>Length</i>
Unit 1	Basic Functions	15
Unit 2	Polynomial and Rational Functions	9
Unit 3	Limits	8
Unit 3	Differentiation	20
Unit 5	Applications of Differentiation	10
Unit 6	Integration	11
Unit 7	Exponential and Logarithmic Functions and Calculus	9
Unit 8	Trigonometric Functions and Calculus	9
Unit 9	Vectors	14
	Final Assessment	5
	Total	110 hours

Required Text

Larson, Hostetler, Edwards.. Calculus I with Precalculus 2nd Ed. Houghton Mifflin, 2006.

Material

Every effort will be made to cover the following topics, (topic numerals are from the text):

UNIT 1: BASIC FUNCTIONS

- Solving Equations P1
- Solving Inequalities P2
- Graphical Representation of Data P3
- Graphs of Equations P4
- Linear Equations P5
- Functions 1.1
- Analyzing Graphs 1.2
- Basic Limits
- Shifting, Reflecting and Stretching Graphs 1.3
- Combinations of Functions 1.4
- Inverse Functions 1.5
- Mathematical Modeling 1.6

UNIT 2: POLYNOMIAL AND RATIONAL FUNCTIONS

- Quadratic Functions 2.1
- Higher Degree Polynomial Functions 2.2
- Polynomial and Synthetic Division 2.3
- Rational Functions 2.6

UNIT 3: LIMITS

- A Preview of Calculus 3.1
- Finding Limits Graphically and Numerically 3.2
- Evaluating Limits Analytically 3.3
- Continuity and One-Sided Limits 3.4
- Infinite Limits 3.5

UNIT 4: DIFFERENTIATION

- The Derivative and Tangent Line Problem 4.1
- Basic Differentiation Rules and Rates of Change 4.2
- The Product and Quotient Rules and Higher Order Derivatives 4.3
- The Chain Rule 4.4
- Implicit Differentiation 4.5
- Related Rates 4.6

UNIT 5: APPLICATIONS OF DIFFERENTIATION

- Extrema On an Interval 5.1
- Rolle's Theorem and the Mean Value Theorem 5.2
- Increasing and Decreasing Functions and the 1st Derivative Test 5.3
- Concavity and the 2nd Derivative Test 5.4
- Limits at Infinity 5.5
- Curve Sketching 5.6

UNIT 6: INTEGRATION

- Antiderivatives and Indefinite Integrals 6.1
- Area 6.2
- Riemann Sums and Definite Integrals 6.3
- The Fundamental Theorem of Calculus 6.4
- Integration By Substitution 6.5

UNIT 7: EXPONENTIAL AND LOGARITHMIC FUNCTIONS AND CALCULUS

- Exponential Functions and their Graphs 7.1
- Logarithmic Functions and their Graphs 7.2
- Using Properties of Logarithms 7.3
- Exponential and Logarithmic Equations 7.4
- Exponential and Logarithmic Models 7.5
- Exponential Functions: Differentiation and Integration 8.1
- Logarithmic Functions: Differentiation 8.2
- Logarithmic Functions and Integration 8.3
- Growth and Decay 8.4

UNIT 8: TRIGONOMETRIC FUNCTIONS AND CALCULUS

- Radians and Degrees 9.1
- Trigonometric Functions: The Unit Circle 9.2
- Right Angle Trigonometry 9.3
- Trigonometric Functions of Any Angle 9.4
- Graphs of Sine and Cosine Functions 9.5
- Graphs of Other Trigonometric Functions 9.6
- Inverse Trigonometric Functions 9.7
- Limits of Trig Functions 11.1
- Trigonometric Functions: Differentiation 11.2
- Trigonometric Functions: Integration 11.3
- Inverse Trig Functions: Differentiation 11.4
- Inverse Trigonometric Functions 11.5

UNIT 9: VECTORS

- Vectors in the Plane 13.3
- Vectors and Dot Products 13.4
- Vectors and Cross Products

- Different Representations of Lines and Planes
- If time permits:
 - Systems of Linear Equations 14.1
 - Multivariable Linear Systems 14.2
 - Systems of Inequalities 14.3
 - Matrices and Systems of Equations 14.4
 - Operations With Matrices 14.5
 - The Inverse of a Square Matrix 14.6
 - The Determinant of a Square Matrix 14.7

Clearly this is a lot of material so completing all of the required homework and constant review are absolutely necessary.

Evaluation

30% of the final mark will be based on the final exam and 70% will be based on evaluations conducted throughout the course. This includes chapter quizzes and homework assignments. Students will also be assessed on each of the following learning skills: ability to work independently, initiative, organization, teamwork, and work habits. Homework will be assigned in each class and not completing it will have adverse effects on understanding the next lesson's material.

Preparation

Being properly prepared to work every day is an essential component of success in this course. Students should bring their textbook, notebook, and calculator to class every day. A three-ring binder with unit dividers is mandatory since physical organization is essential to mental organization of the numerous, but interrelated concepts in mathematics. A separate section in your notebook is also mandatory and will be used after each lesson to record key information for use as a study aid.

Absence

All lessons are meaningful and relevant to previous and subsequent material and any absence by the student is detrimental to his/her performance. Absences disrupt the continuity of instruction and cannot be entirely regained, even by additional assistance after school. Since mathematics is much more about learning a mode of rational thought than remembering key facts, the developmental process that takes place in class cannot be duplicated by private study alone.

Tutoring

Students finding difficulty with the material are encouraged to approach their teacher for assistance. Extra help is available and after-school tutoring sessions