

## **The Governor's Scholl for Science and Technology**

### **Calculus Syllabus 2022-2023**

Instructor: Rimma Feygelson

Meets: MTWRF 7:10 AM – 7:55 AM; 1:00 PM – 1:45 PM

### **Textbooks**

Calculus Early Transcendentals, 7th edition, by Stewart

An optional secondary resource is linked into each homework assignment. Please note that the chapter numbers are not all the same as those referenced in our primary resources.

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### **Required Materials**

- A graphing calculator (which we will rarely use).
- A wifi capable device for assignments.

### **Schedule**

Please refer to the Canvas Calendar for the course schedule. It is a tentative schedule and is subject to changes. All changes will be announced in class and updated in the Canvas Calendar.

### **Grading**

Homework (15%): Homework assignments are embedded in Canvas via the OER MyOpenMath. You do not need or use a MyOpenMath account to access them because they are embedded within the course. They are due nearly every Sunday evening - the same day every week to help you remember! You get 100 attempts on all homework problems. Please note the due dates in the Canvas Calendar.

Quizzes (25%): You get one attempt on a quiz and one attempt per problem. **Quizzes are taken in class, are timed, and must be completed all at once.** Please note the dates in the Canvas Calendar.

Tests (60%): There are three tests in quarters 1, 2, and 3. There may be two or three tests in quarter 4. The content of each test is included in the name of assignment. You can find all tests and their dates in the Canvas Calendar.

### **Late Work**

Homework & Quizzes: These assignments are not excepted late under any circumstances except the following:

- extreme circumstances with supporting documentation

Tests: If you miss a test due to an excused and documented absence, you may take it late without penalty. If you miss a test due to an unexcused absence, you may take it late with a 20% deduction.

### **Missed/Canceled Class**

If you miss a class for any reason, you are responsible for watching the virtual content posted in Modules in Canvas.

If a class is canceled for any reason, you may be assigned virtual lessons (e.g., video lectures, reading assignments, etc.).

### **Communication**

You must check your Canvas Inbox, Governor's School email, and Canvas Announcements regularly. This is especially important as it relates to the Missed/Canceled Class policy above.

### **Classroom Expectations**

You are expected to adhere to the following rules.

1. Cell phones are put away unless asked to use them.
2. You do not interrupt others while they're speaking.
3. Be attentive to others while they're speaking.
4. Be supportive of your classmates.
5. Laptops or tablets are only used for class-related activities.

Failure to adhere to the above rules will forfeit your participation grade for that day.

### **Dual Enrollment**

You are eligible to receive dual enrollment for MTH 263 Calc 1 in Fall 2022 and MTH 264 Calc 2 from VPCC. If you want to decline dual enrollment, it must be declared in writing signed by a guardian.

While the Governor's School for Science and Technology (GSST) will do all in its power to secure dual enrollment (DE) status for its courses, dual enrolled course credits are not guaranteed. Since the Virginia Community College System (VCCS) and Virginia Peninsula Community College (VPCC) set the criteria for DE and must approve each course and instructor, unavoidable circumstances that are not within the control of GSST may change the DE eligibility of any given GSST course. Alternative pathways for meeting specialty program requirements (E.g. concurrent Associates Degree) should be discussed in advance with the home high school counselor.

### **MyOpenMath**

This is an open (free) educational resource that you will use for many assignments. The content is created by instructors around the world. Since it does not go through a formal publishing process, there are occasionally errors. Please let me know of any assignments containing errors within a week of their due dates.

## Academic Dishonesty

Penalties for cheating vary based on the assignment. Deductions vary from 20% to 100%.

## COVID policies

In case of COVID-related meeting restrictions, we will **not** miss a class. Monitor your Canvas Inbox, Governor's School email, and Canvas Announcements for instructions.

**CODE OF CONDUCT:** Coming to class prepared to learn includes (but is not limited to) having all of the necessary supplies, arriving on time, staying the full time, and participating in the activities of the class.

## Calculus I Course Objectives (1<sup>st</sup> Semester)

- Limits
  - Differentiate between the limit and the value of a function at a point
  - Find the limit of a function by numerical, graphical and analytic methods
  - Apply Limit Laws
  - Calculate one-sided limit of a function
  - Prove the existence of a limit using precise definition of the limit
  - Determine the continuity of a function
  - Calculate Vertical and Horizontal asymptotes using limits
- Derivatives and Differentiation Rules
  - Define Derivatives and Rates of Change
  - Compute derivatives of basic functions using the definition of the derivative
  - Differentiate polynomial, rational, radical, exponential and logarithmic functions
  - Find equation of a tangent line using derivative
  - Differentiate trigonometric functions
  - Apply product, quotient, chain rules
  - Apply implicit differentiation and find derivatives of inverse trigonometric functions
  - Apply concept of rates of change to natural and social sciences
  - Apply the concept of related rates
  - Define hyperbolic functions and their derivatives
  - Find linear approximation of a function at a given point
- Applications of Differentiation
  - Calculate local and absolute maximum and minimum values of a function
  - Apply Rolle's Theorem and Mean Value Theorem to study properties of a function
  - Find critical points, and intervals of increasing and decreasing values of a function
  - Find points of inflection and intervals of different concavities
  - Sketch a curve for a given function
  - Apply rules of differentiation to solve optimization problems

- Find antiderivatives for basic functions using knowledge of derivatives
- Integrals
  - Relate areas to definite integrals using sigma notation, Riemann Sums, and limits. [Note: L'Hopital's Rule is in Calc II but may be used for instructional purposes here.]
  - Apply Fundamental Theorem of Calculus to find definite integrals and derivatives
  - Find indefinite integrals of polynomials and basic trigonometric and exponential function
  - Apply Net Change Theorem
  - Perform integration using substitution
  - Find areas between curves
  - Find average value of a function

### **Calculus I Course Major Topics (1<sup>st</sup> Semester)**

- Limits
- Derivatives and Differentiation Rules
- Applications of Differentiation
- Integrals

### **Calculus II Course Objectives (2<sup>nd</sup> Semester)**

- Applications of Integration
  - Compute Volumes by cross-section
  - Compute Volumes by disk-washer
  - Compute Volumes by shells
  - Compute Work (spring, rope)
  - Compute Work (pumping liquids)
  - Compute Arc length
  - Compute Areas of surfaces of revolution
  - Compute Application (center of mass)
- Techniques of Integration
  - Integrate by parts
  - Calculate trigonometric integrals
  - Calculate integrals by trigonometric substitution
  - Define the indeterminate form and apply L'Hopital's Rule.
  - Calculate improper integrals
  - Integrate by partial fractions
  - Integrate using Tables and Software
  - Approximate integrals (Trapezoidal, Simpson) with error estimation.
- Infinite Sequences and Series
  - Write definition of and understand Sequences
  - Write definition of and understand Series (intro)
  - Determine convergence by integral test
  - Determine convergence by comparison test

- Determine convergence of alternating series
  - Determine absolute convergence (ratio, root tests)
  - Apply strategies for testing series
  - Work with power series
  - Represent functions as power series
  - Find Taylor, Maclaurin series & polynomials
  - Calculate Taylor and Maclaurin series
- Parametric Curves and Polar Coordinates
  - Represent curves by parametric equations
  - Perform calculus with parametric curves
  - Use and graph with polar system
  - Calculate areas and lengths in polar coordinates
  - Define the conic forms in polar form

### **Calculus II Course Major Topics (2<sup>nd</sup> Semester)**

- Applications of Integration
- Techniques of Integration
- Infinite Sequences and Series
- Parametric Curves and Polar Coordinates