

# Calculus III / Differential Equations

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**Room:** F133

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**Textbook:** Calculus: Early Transcendental Functions, 6<sup>th</sup> Ed., Cengage Learning Center, 2015  
Fundamentals of Differential Equations, 8<sup>th</sup> Ed., Addison-Wesley, 2012

## Supplemental supplies:

Students will need a graphing calculator (TI-84 preferred), and a spiral, 3-ring notebook, or composition notebook for Calculus notes and assignments **only**.

## Chandler Gilbert Community College credit:

Students who have received a C or better in Calculus I and II through CGCC, or who have received a 4 or 5 on the AP Calculus BC exam, may choose to enroll for college credit through Chandler Gilbert Community College. Please see the Dual Enrollment form attached in the welcome announcement on Google Classroom. By successfully completing the first semester, the student can earn college credit for MAT 241 – Calculus with Analytic Geometry III (4 credit hours). Second semester, the student may obtain college credit for MAT 276 – Differential Equations (4 credit hours). The grade obtained in my class will be the grade given for the college transcript. These are the section numbers needed to register:

Calculus III – MAT 241 – Section #14626, Differential Equations – MAT 276 – Section #17967

## Attendance Policy:

- I will follow the official school policy on absences.
- If you are absent for a review or test day, you will take the test on your first day back.

## Grading Policy:

- Tests and quizzes will be worth 90% of the cumulative quarter grade.
- Homework is expected to be done each day, will be checked for completion, and is worth 10% of the grade. It is to be kept in the same notebook as your notes, which will be checked also.
- The grading scale is 90-80-70-60, and grades are updated weekly on Infinite Campus.
- There are no retakes on exams, so ask all questions when reviewing for a test or doing HW.
- Semester grades are calculated with the two quarters counting for 80%, the final worth 20%.

## Class Structure:

- Each day I will provide a lesson, and students are expected to take notes and ask questions as needed.
- You will have an assignment sheet for each chapter that shows the sections we are doing and the problems for each that are required.
- Check my Perry website and classroom whiteboard for a calendar of dates for quizzes, tests and assignments.
- If you are absent, you can see what you missed from the assignment sheet and Perry website.
- There is more time available in the class to work than there was in AP Calculus BC, use it wisely.
- Ask for help as needed. Don't fall behind in the material, I'm here to help. ☺

### Calculus III – Course Outline

#### Vectors and the Geometry of Space

- Vectors in the Plane
- Vectors in Space
- The Dot Product
- The Cross Product
- Lines and Planes in Space
- Surfaces in Space

#### Vector-Valued Functions

- Vector-Valued Functions
- The Calculus of Vector-Valued Functions
- Motion in Space
- Curvature
- Tangent and Normal Vectors
- Parametric Surfaces

#### Functions of Several Variables and Partial Differentiation

- Functions of Several Variables
- Limits and Continuity
- Partial Derivatives
- Tangent Planes and Linear Approximations
- The Chain Rule
- The Gradient and Directional Derivatives
- Extrema of Functions of Several Variables
- Constrained Optimization and Lagrange Multipliers

#### Multiple Integrals

- Double Integrals
- Area, Volume, and Center of Mass
- Double Integrals in Polar Coordinates
- Surface Area
- Triple Integrals
- Cylindrical Coordinates
- Change of Variables in Multiple Integrals

#### Vector Calculus

- Vector Fields
- Line Integrals
- Independence of Path and Conservative Vector Fields
- Green's Theorem
- Curl and Divergence
- Surface Integrals
- The Divergence Theorem
- Stokes' Theorem
- Applications of Vector Calculus

### Differential Equations – Course Outline

#### Introduction

- Background
- Solutions and Initial Value Problems
- Direction Fields
- The Approximation Method of Euler

#### First-Order Differential Equations

- Introduction: Motion of a Falling Body
- Separable Equations
- Linear Equations
- Exact Equations
- Special Integrating Factors
- Substitutions and Transformations

#### Mathematical Models and Numerical Methods for 1<sup>st</sup> ODE

- Mathematical Modeling
- Compartmental Analysis
- Heating and Cooling
- Electrical Circuits
- Improved Euler's Method, Taylor and Runge-Kutta

#### Linear Higher-Order Differential Equations

- Homogeneous Linear Equations
- Auxiliary Equations with Complex Roots
- The Method of Undetermined Coefficients
- The Superposition Principle
- Variation of Parameters
- Variable Coefficient Equations

#### Introduction to Systems and Phase Plane Analysis

- Differential Operators and the Elimination Method
- Solving systems and Higher-Order DE Numerically
- Introduction to the Phase Plane
- Applications to Biomathematics

#### Laplace Transforms

- Definition and Properties of Laplace Transform
- Inverse Laplace Transform
- Solving Initial Value Problems
- Transforms of Discontinuous and Periodic Functions
- Convolution
- Impulses and the Dirac Delta Function
- Solving Systems with Laplace Transforms

#### Series Solutions of Differential Equations

- Power Series and Analytic Functions
- Power Series Solutions to Linear DE
- Cauchy-Euler Equations
- Method of Frobenius

#### Matrix Methods for Linear Systems

- Linear Systems in Normal Form
- Homogeneous Linear Equations
- Complex Eigenvalues
- Nonhomogeneous Linear Systems