Calculus III / Differential Equations

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Textbook: *Calculus*: Early Transcendental Functions, 6th Ed., Cengage Learning Center, 2015
Fundamentals of Differential Equations, 8th 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. Registration materials will be due on August 27th, and payment for 1st semester due shortly after. 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:

Period 2: Calculus III – MAT 241 – Section #22906, Differential Equations – MAT 276 – Section #18535
Period 3: Calculus III – MAT 241 – Section #40401, Differential Equztions – MAT 276 – Section #34123

Attendance Policy:
I will follow the official school policy on absences and tardies, found on the website under *Attendance*. After an excused absence, you will have as many days as you were absent to make up the work. If you are absent from a test, expect to take it in class the day that you return.

Grading Policy:
- Tests, quizzes and projects will be worth 90% of the grade.
- Homework is expected to be complete each day, will be checked for completion daily, and is worth 10% of the grade.
- The grading scale is 90-80-70-60, and grades are updated weekly on Infinite Campus.
- Semester grades are calculated with the two quarters counting for 80%, the final worth 20%.
- Semester grades are calculated with the percent scores earned, not letter grades.

Class Structure:
- Each day I will check homework, answer questions, explain the next lesson, and give time to work (if there is any time left). There will be time in the class for doing homework on given work days.
- An assignment sheet will be given out each chapter, but the schedule that is followed will be determined each week to allow for flexibility in pacing
- Check calendar on website for due dates of quizzes, tests and assignments.
- Use the time in class to finish work and get help from me when you need it. Don't let yourself get behind on the material. I am 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 ChainRule
- 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 1st 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

Partial Differential Equations
- Introduction
- Separation of Variables
- Fourier Series
- Laplace's Equation