



**DUAL ENROLLMENT VECTOR CALCULUS
TIDEWATER COMMUNITY COLLEGE MATH 277
(FIRST COLONIAL AND SALEM HIGH SCHOOLS ONLY)**

Counselors are available to assist parents and students with course selections and career planning. Parents may arrange to meet with the counselor by calling the school's guidance department.

COURSE DESCRIPTION

Vector Calculus is a dual enrollment, one-semester course providing the successful student with four college semester credits and one-half Virginia Beach City Public Schools (VBCPS) elective credit. This course provides an introduction to vector-valued functions, functions of several variables, partial differentiation, multiple integrals, and vector analysis. Vectors play a role in nearly all areas of mathematics and its applications. More advanced physical applications of vectors include aerodynamics, electromagnetic theory, quantum theory, and more recent fields such as computer graphics, image processing, and robotics.

*Tuition, fees, and textbook fees are the responsibility of the student in accordance with the dual enrollment regulation (5-30.2).

PREREQUISITE

Students who have either successfully completed Advanced Placement (AP) Calculus BC with a minimum score of four on the corresponding AP exam or who have completed the dual enrollment course *Calculus with Analytic Geometry II (MATH 174)*.

Objectives for Math 277: Vector Calculus

The student will be able to:

1. review basic differentiation and integration techniques from Calculus BC.
2. graph vectors in a plane.
3. translate between coordinate and vector space notation.
4. apply vector operations (addition, scalar multiplication, dot and cross products) to solve geometric and applied problems.
5. convert points and equations between Cartesian, cylindrical, and spherical coordinates in three space or between Cartesian and polar in two space and sketch polar curves.
6. identify quadratic equations in two variables with corresponding conic curves or in three variables with quadric surfaces and sketch them.
7. evaluate vector-valued functions as a set of parametric equations in either two space or three space.
8. find concavity and slope for a vector-valued function.
9. find velocity and acceleration given the position vector function of time.
10. identify and interpret tangential and normal components of acceleration.
11. differentiate and integrate vector-valued functions.
12. find arc length and curvature of vector-valued functions.
13. compute values for functions of several variables.
14. determine limits and continuity for functions of several variables.
15. calculate and interpret first and second partial derivatives and, for composite functions, apply the chain rule.
16. find and classify critical points of a function of two or more variables as maxima, minima, or saddle points and find absolute extrema over a closed-bounded domain.
17. find tangent planes and normal lines to multivariate functions.
18. find, interpret, and apply the gradient of a function.
19. optimize a function with given constraints, using the method of Lagrange Multipliers.
20. compute area in a plane using iterated integrals.
21. compute volumes of solids using double integrals.
22. use multiple integration techniques to compute surface areas of solids.
23. solve multiple integration problems involving polar, spherical, and cylindrical coordinates.
24. compute the Jacobian Matrix involved in changing variables.
25. compute vector fields and study their applications.
26. set up and compute line integrals.
27. study conservative vector fields and independence of path.
28. study Green's Theorem and Stokes Theorem.
29. study the Divergence Theorem for vector-valued integrals.



VIRGINIA BEACH CITY PUBLIC SCHOOLS
A H E A D O F T H E C U R V E

MISSION STATEMENT

The Virginia Beach City Public Schools, in partnership with the entire community, will empower every student to become a life-long learner who is a responsible, productive and engaged citizen within the global community.

DEPARTMENT OF CURRICULUM AND INSTRUCTION

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Alternative formats of this publication which may include taped, Braille, or large print materials are available upon request for individuals with disabilities. Call or write The Department of Curriculum and Instruction, Director of Secondary Instructional Services, Virginia Beach City Public Schools, 2512 George Mason Drive, P.O. Box 6038, Virginia Beach, VA 23456-0038, Telephone (757) 263-1070 or (757) 263-1429, fax (757) 263-1412.