University of Maine – Department of Mathematics & Statistics
MAT 300 – Topics in Mathematics – Vector Calculus
Fall 2023

Instructor: Jack Buttcane, jack.buttcane@maine.edu

Lecture: MWF 10:00-10:50am in Neville Hall 421

Credits: 3

Prerequisites: A grade of C or higher in MAT 228

Calculus III ends before we get to some of the most interesting and useful bits. This class will review some topics from MAT 228 and cover them with more mathematical rigor, then develop the main theorems of vector calculus: Green's Theorem, the Divergence Theorem, and Stokes' Theorem. A significant portion of applied mathematics is based on the foundation of vector calculus and these fundamental theorems – topics such as fluid dynamics, mechanics and electromagnetism depend heavily on the calculus of vector quantities in three dimensions.

The topics covered include:

- Vector algebra,

- Line, Surface and Volume integrals,

- Divergence, Gradient and Curl,

- Green's Theorem, the Divergence Theorem and Stokes' Theorem,

- Other topics as time allows; e.g. Curvilinear coordinates, Tensors, Differential forms.

Applications will include:

- Heat transfer,

- Electromagnetism,

- Meteorology,

- Continuum mechanics,

- Solid mechanics,

- Fluid mechanics.