

M427L (55200), Homework #12

Due: 12:00pm, Monday, Nov. 21

Instructions: Questions are from the book "Vector Calculus, 5th ed." by Marsden and Tromba. Please show all your work, not only your final answer, to receive credit. Keep answers organized in the same order the problems have been assigned.

Surface integrals of vector fields (7.6)

p. 497-500, #1, 2, 3, 5, 7, 9, 10, 16, 18

Green's theorem (8.1)

p. 528-532, #1, 2, 3, 4, 7, 9, 11, 12, 13

In addition:

- Instead of the vector field generated by a point vortex as in the additional problem in Homework #10, consider the rigid body rotational field

$$\mathbf{V}(x, y) = -\omega y\mathbf{i} + \omega x\mathbf{j}$$

where ω is some constant.

- a) Let $D \subset \mathbb{R}^2$ be any simple region in the plane. Use the vector form of Green's theorem to compute the line integral

$$\int_{\partial D} \mathbf{V} \cdot d\mathbf{s}$$

where the curve ∂D is traversed counterclockwise.

- b) Find

$$\int_{\partial D} \mathbf{V} \cdot \mathbf{n} \, ds$$

using the divergence theorem in the plane, where the curve ∂D is again traversed counterclockwise.