Math 32B-2: Calculus of Several Variables – Homework #10

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Due: June 7, 2019

Exercise 1.

(1) Let $G(x, y, z) = (x, y, z)$. Show that there exists no vector field $A : \mathbb{R}^3 \to \mathbb{R}^3$ such that curl(A) $= G$. *Hint:* compute its divergence.

(2) Let $H : \mathbb{R}^3 \to \mathbb{R}^3$ be given as $H(x, y, z) = (1, 2, 3)$. Find a vector potential $A : \mathbb{R}^3 \to \mathbb{R}^3$ such that curl(A) $= H$. Show that if A is a vector potential for H, then so is $A + \nabla f$, for any $f : \mathbb{R}^3 \to \mathbb{R}$ smooth function.

(3) Let H be defined as in (3), and let S be the sphere centered at the origin with radius 2019. Compute $\displaystyle\iint_S H \cdot \mathrm{d}S$.

Exercise 2.

Exercise 28 on page 997 from Rogawski-Adams. Exercises 6, 10, 12, 18 on page 1007 from Rogawski-Adams.

Exercise 3.

Exercises 24, 30, 32, 36 on page 1008 from Rogawski-Adams.

Exercise 4.

(1) Using the steps from Exercise 39, solve Exercises 40 on page 1008 from Rogawski-Adams.

(2) Exercises 28, 36 on page 1010-1011 from Rogawski-Adams.