

Please sign your name: _____

Math 335-002 * Spring 2015 * Quiz #5 * Prof. Victor Matveev

1. Suppose \mathbf{F} is a C^2 (twice differentiable) vector field in \mathbf{R}^3 . Which of the following expressions are meaningful, and which are nonsense? For those which are meaningful, decide whether the expression's result is a scalar field or a vector field. Finally, indicate which of these expressions is/are zero for any smooth vector field \mathbf{F} .

- a) $\text{div}(\text{div } \mathbf{F})$
- b) $\text{grad}(\text{div } \mathbf{F})$
- c) $\text{curl}(\text{div } \mathbf{F})$
- d) $\text{curl}(\text{grad } \mathbf{F})$
- e) $\text{div}(\text{grad } \mathbf{F})$
- f) $\text{grad}(\text{grad } \mathbf{F})$
- g) $\text{div}(\text{curl } \mathbf{F})$
- h) $\text{curl}(\text{curl } \mathbf{F})$
- i) $\text{grad}(\text{curl } \mathbf{F})$

2. Sketch the region of integration, and then change the order of integration. Evaluate this integral in any order you like:

$$\int_1^e \int_{\ln x}^1 e^{2y} dy dx$$