MA 261 Quiz 11
April 9, 2019

If you do not know how to do any one of these problems, circle **"(E) I don't know"** as your answer choice. You will receive **two points** for doing that. **Each problem** is worth **five points**. You get **two points** for writing your **full name** and **three points** for writing your **section number**.

Problem 11.1. Let $\mathbf{F}$ be a vector field and f a scalar field. Which of the following expressions are meaningful?

i. $\operatorname{curl} f$
ii. $\operatorname{div}(\operatorname{grad} f)$
iii. $(\operatorname{grad} f) \times (\operatorname{div} \mathbf{F})$
iv. $\operatorname{curl}(\operatorname{curl} \mathbf{F})$

(A) i only
(B) ii and iv only
(C) i, iii, and iv only
(D) iii only
(E) I don't know how to do this problem

Problem 11.2. Compute $\operatorname{div}(\operatorname{curl} \mathbf{F})$ for $\mathbf{F}(x, y, z) = yz^2\mathbf{i} + xy\mathbf{j} + yz\mathbf{k}$.
(A) 0
(B) 1
(C) 2
(D) 3
(E) I don't know how to do this problem

Problem 11.3. $\mathbf{F}(x, y, z) = yz\mathbf{i} + xz\mathbf{j} + xy\mathbf{k}$ is conservative, i.e., $\mathbf{F} = \operatorname{grad} f$ for some f. Find $\int_C \mathbf{F} \cdot d\mathbf{r}$ where C is the segment of the curve

$$\mathbf{r}(t) = t^3\mathbf{i} + (1 + t^2)\mathbf{j} + (1 + t)^2\mathbf{k}$$

from $0 \le t \le 1$.
Hint: By the Fundamental Theorem of Line Integrals, $\int_C \mathbf{F} \cdot d\mathbf{r} = f(b) - f(a)$ where a is the starting point of C and b the end point.
(A) 4
(B) 5
(C) 7
(D) 8
(E) I don't know how to do this problem