Math 20E

September 5, 2013

Question 1 Suppose $\mathbf{F}$ is a conservative vector field on $\mathbb{R}^3$. Then,

A. $\nabla \cdot \mathbf{F} = k$ for some constant k.

B. $\int_C \mathbf{F} \cdot d\mathbf{s} = 0$ along every oriented simple closed curve C.

C. $\nabla \times \mathbf{F} = \mathbf{0}$

D. There is a scalar function $f : \mathbb{R}^3 \to \mathbb{R}$ for which $\mathbf{F} = \nabla f$

*__E.__ **B**, **C** and **D**

Question 2 Suppose $\mathbf{F}$ is a C^1 vector field on $\mathbb{R}^3$. Let H be the unit hemisphere given by $x^2+y^2+z^2=1$ with $z \geq 0$, let D be the unit disk given by $z=0$ with $x^2+y^2 \leq 1$, and let $S = H \cup D$. Then,

A. $\partial H = \partial D$, including orientation when H and D are both oriented with the upward-pointing unit normal vector.

B. $\displaystyle\iint_H (\nabla \times \mathbf{F}) \cdot d\mathbf{S} = \iint_D (\nabla \times \mathbf{F}) \cdot d\mathbf{S}.$

C. $\displaystyle\iint_S (\nabla \times \mathbf{F}) \cdot d\mathbf{S} = \iint_H (\nabla \times \mathbf{F}) \cdot d\mathbf{S} + \iint_D (\nabla \times \mathbf{F}) \cdot d\mathbf{S}.$

D. $\displaystyle\iint_S (\nabla \times \mathbf{F}) \cdot d\mathbf{S} = 0.$

***E.** **A**, **B** and **D**

Question 3 The use of clickers in this course was

A. Very helpful for reviewing the important conceptual ideas of the subject.

B. An easy way to earn extra credit.

C. A fun way to start each class period.

D. The way the professor encouraged me to get to class on time.

E. A complete waste of time.