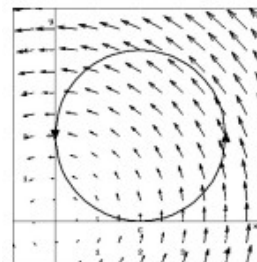


Name _____ u-id: _____

This is the take-home portion of the final exam for Calculus 3. Please turn it in at the beginning of class on Friday, August 3, 2016 (right before we start the in-class portion of the final exam). You must turn it in by the time the final exam starts in order to get any credit at all on this portion of the exam.

Note: If you'd prefer to video-record your answers and email them to me, that's acceptable as well, but the email must be received (macarthur@math.utah.edu) by 9:30 am on August, 3rd. And, you're welcome to email me a pdf version of your work, or a picture of your work. However, I'd much prefer to have the written original turned in for grading purposes. (If you only email it to me and we can't read it easily while grading, then you may not get all the points.)

10. Let C be the closed curve shown in the picture below, embedded in that vector field. Indicate which of the statements (given in each part) is correct and give a short explanation for your answer.



- (a) (3 points) $\oint_C \mathbf{F} \cdot d\mathbf{r} > 0$ $\oint_C \mathbf{F} \cdot d\mathbf{r} < 0$ $\oint_C \mathbf{F} \cdot d\mathbf{r} = 0$ (circle one)

Why? _____

- (b) (3 points) $\oint_C \mathbf{F} \cdot \hat{\mathbf{n}} ds > 0$ $\oint_C \mathbf{F} \cdot \hat{\mathbf{n}} ds < 0$ $\oint_C \mathbf{F} \cdot \hat{\mathbf{n}} ds = 0$ (circle one)

Why? _____

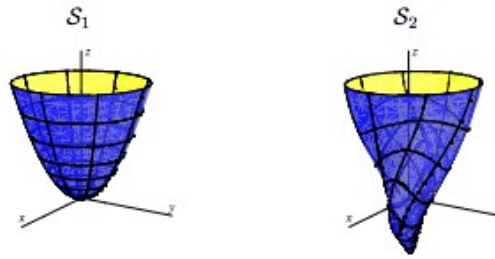
- (c) (3 points) \mathbf{F} is conservative \mathbf{F} is not conservative (circle one)

Why? _____

11. (2 points) Suppose S is a closed surface (that is a surface with a boundary). Which of these statements must be true?

- $\iint_{S_1} \mathbf{F} \cdot d\mathbf{S} = 0$ $\iint_{S_1} \text{curl } \mathbf{F} \cdot d\mathbf{S} = 0$ (circle which one is always true)

12. (3 points) Suppose S_1 and S_2 are the surfaces depicted below, and notice that they both share the same boundary curve at the top (we'll call that boundary curve C). What can you say about $\iint_{S_1} \text{curl } \mathbf{F} \cdot d\mathbf{S}$ and $\iint_{S_2} \text{curl } \mathbf{F} \cdot d\mathbf{S}$?



13. (3 points) Explain (in your own words) what Stokes theorem states, conceptually (or geometrically).

14. (3 points) Explain (in your own words) the relationship between Green's Theorem and Gauss' Divergence Theorem, conceptually (or geometrically).