Name ____________________

Physics 51M Section ___ Box # _____

Problem Set 9

18 November 2019

Collaborators:

(a) Sketch the vector function

$$\vec{F}(x, y) = -y\hat{x} + x\hat{y}$$

Write down your guess for the direction of the curl of $\vec{F}$, $\nabla \times \vec{F}$, with a few words of justification. (b) Calculate the curl of $\vec{F}$ and compare with your prediction in part (a). (c) Rewrite $\vec{F}$ in cylindrical coordinates, and compute $\nabla \times \vec{F}$ using the cylindrical form of the curl. Compare with your result from part (b).

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(a) Sketch the following function $\vec{F}(x, y, z)$ in the $z = 1$ plane:

$$\vec{F}(x, y, z) = yz\hat{x} + xz\hat{y} + xy\hat{z}$$

ignoring the out-of-plane z-component of $\vec{F}$. Now consider the z-component of $\nabla \times \vec{F}$ and write down your guess for its sign. (b) Calculate the curl of $\vec{F}$ and compare with your prediction in part (a).

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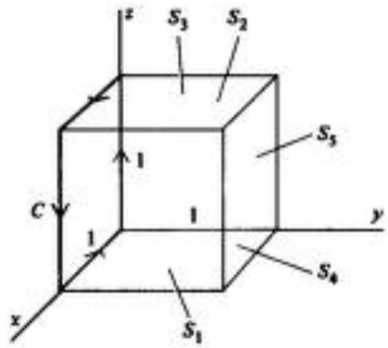
Schey: III-15(a) Verify Stokes's Theorem for $\vec{F} = \vec{i}z^2 - \vec{j}y^2$, $\mathbb{C}$, the square of side 1 lying in the xz-plane and directed as shown. Also compute the right-hand side of Stokes's Theorem using surface S_6, the square enclosed by the path $\mathbb{C}$ in the $x - z$ plane, and compare with your previous answers.



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