"QUIZ" for Lecture 24

NAME: (print!) SAI EMBAR Section: 23

E-MAIL SCANNED .pdf OF COMPLETED QUIZ to DrZcalc3@gmail.com (Attachment: q24FirstLast.pdf) ASAP BUT NO LATER THAN Dec. 4, 2020, 8:00pm

By using Stokes' Theorem, or otherwise, evaluate $\int_C \mathbf{F} \cdot d\mathbf{r}$, where

$$F(x,y,z) = (yz + 2y + 3z)\mathbf{i} + (xz + 2x + 4z)\mathbf{j} + (xy + 3x + 4y)\mathbf{k} \quad ,$$

where C is the curve of intersection of the plane $x+y+z=1$ and the cylinder $x^2+y^2=1$, oriented counterclockwise as viewed from above. Be sure to explain everything.

$$\int_C F \cdot dr = \iint_S \operatorname{curl}(F) \cdot dS$$

$$\operatorname{Curl}(F) = \begin{vmatrix} i & j & k \\ \frac{\partial}{\partial x} & \frac{\partial}{\partial y} & \frac{\partial}{\partial z} \\ yz+2y+3z & xz+2x+4z & xy+3x+4y \end{vmatrix}$$

$$i\left(\frac{\partial}{\partial y}(xy+\cancel{3x}+4y) - \frac{\partial}{\partial z}(xz+2x+4z)\right) - j\left(\frac{\partial}{\partial x}(xy+3x+4y) - \frac{\partial}{\partial z}(yz+2y+3z)\right)$$
$$+k\left(\frac{\partial}{\partial x}(xz+2x+4z) \frac{\partial}{\partial y}(yz+2y+3z)\right)$$

$$i(x+4-(x+4)) - j(y+3-(y+3)) + k(z+2-(z+2)) = 0\hat{i} - 0\hat{j} + 0\hat{k} = \langle 0,0,0\rangle$$

Since $\operatorname{curl}(F) = \langle 0,0,0\rangle$ answer is $\boxed{0.}$