"QUIZ" for Lecture 22

NAME: (print!) SAI EMBAR **Section:** 23

E-MAIL SCANNED .pdf OF COMPLETED QUIZ to DrZcalc3@gmail.com (Attachment: q22FirstLast.pdf) ASAP BUT NO LATER THAN Nov. 16, 8:00pm

Evaluate the surface integral $\int\int_S \mathbf{F} \cdot d\mathbf{S}$ for the given vector field $\mathbf{F}$ and oriented surface S.

$$\mathbf{F}(x, y, z) = \langle xy\,,\, yz\,,\, zx \rangle \quad ,$$

and S is the part of the paraboloid $z = 1 - x^2 - y^2$ that lies above the square $0 \le x \le 1\,,\, 0 \le y \le 1$ and has upward orientation.

$\iint_S F \cdot dS = \iint_D \left(-P\frac{\partial g}{\partial x} - Q\frac{\partial g}{\partial y} + R\right) dA$

$P = xy,\ Q = yz,\ R = zx,\ g(x,y) = 1 - x^2 - y^2$

$\iint_D (2x^2y + 2y^2z + xz)\, dA$

$= \iint_D (2x^2y + 2y^2(1-x^2-y^2) + x(1-x^2-y^2))\, dA$

$= \int_0^1 \int_0^1 (2x^2y + 2y^2 - 2y^2x^2 - 2y^4 + x - x^3 - xy^2)\, dx\, dy$

Doing both the integrals out you get $\frac{83}{150}$