

"QUIZ" for Lecture 22

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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  $S$ .

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

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

$$\mathbf{F} = \langle P, Q, R \rangle$$

$$\iint_S \mathbf{F} \cdot d\mathbf{s} = \iint_D \left( -P \frac{\partial z}{\partial x} - Q \frac{\partial z}{\partial y} + R \right) dA$$

$$P = xy, \quad Q = yz, \quad R = zx$$

$$\iint_D (-xy(-2x) - yz(-2y) + xz) dA$$

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

$$\int_0^1 \int_0^1 (2x^2y + 2y^2(1-x^2-y^2) + x(1-x^2-y^2)) dA$$

$$= \boxed{\frac{83}{180}}$$