NAME: (print!) _Niharika   Kompella_   **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 $^R\!R_S\, \mathbf{F} \cdot d\mathbf{S}$ for the given vector field $\mathbf{F}$ and oriented surface S.

$$\mathbf{F}(x,y,z) = \mathrm{h}xy\,,\,yz\,,\,zx\mathrm{i}\qquad ,$$

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.

$$r(x,y) = x\vec{i} + y\vec{j} + (1-x^2-y^2)k$$

$$r_x = i - 2xk$$
$$r_y = j - 2yk \qquad r_x \times r_y = 2x\vec{i} + 2y\vec{j} + k$$

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

$$-\frac{(-x^2-y^2-1)}{4} + \frac{2x^3y}{3} + 2y^2\left(-\frac{x^3}{3}-y^2x+x\right)\Big|_0^1 = \frac{-24y^4-10y^2-8y-3}{12}$$

$$\int_1^1 \frac{-24y^4-10y^2-8y-3}{12} = \frac{y(72y^4+50y^2-60y-45)}{180}\Big|_0^1 = \boxed{\frac{83}{180}}$$