"QUIZ" for Lecture 20

NAME: (print!) Yeram Sarah Jung **Section:** 23

E-MAIL SCANNED .pdf OF COMPLETED QUIZ to DrZcalc3@gmail.com (Attachment: q20FirstLast.pdf) ASAP BUT NO LATER THAN Nov. 16, 8:00pm

1. Find an equation for the tangent plane to the parametric surface

$$x = v^2 \quad , \quad y = u + v \quad , \quad z = u^2 \quad ,$$

at the point $(1, 2, 1)$. Simplify as much as you can!

$u = 1 \quad v = 1$

$r = v^2 i + (u+v) j + u^2 k$

$r_u = 0i + 1j + 2uk$ $\quad r_u(1,1) = 0i + 1j + 2k$ $\quad r_u = \langle 0, 1, 2 \rangle$

$r_v = 2vi + 1j + 0k$ $\quad r_v(1,1) = 2i + 1j + 0k$ $\quad r_v = \langle 2, 1, 0 \rangle$

$$r_u \times r_v = \begin{vmatrix} i & j & k \\ 0 & 1 & 2 \\ 2 & 1 & 0 \end{vmatrix} = -2i + 4j + 2k$$

$N = \langle -2, 4, 2 \rangle$

point $(1, 2, 1)$ $\quad -2(x-1) + 4(y-2) + 2(z-1) = 0$

$-2x + 2 + 4y - 8 + 2z - 2 = 0$

$-2x + 4y + 2z = 8$

$x - 2y - z = -4$

2. Evaluate the surface integral

$$\int\int_S z \, dS \quad ,$$

where S is the triangular region with vertices $(2, 0, 0), (0, 2, 0), (0, 0, 2)$.

$$\int_0^2 z \, ds = \frac{z^2}{2}\Big|_0^2 = 2 - 0 = 2$$

$$\int_0^2 z \, ds = 2z\Big|_0^2 = 4 - 0 = \boxed{4}$$

"QUIZ" for Lecture 22

NAME: (print!) Yeram Sarah Jung **Section:** 23

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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.

$g = 1 - x^2 - y^2$

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

$\int\int_D (-xy(-2x) - yz(-2y) + zx)\, dA$

$= \int\int_D (2x^2y + z(2y^2 + x))\, dA$

$z = 1 - x^2 - y^2$

$\int\int_D (2x^2y + (1 - x^2 - y^2)(2y^2 + x))\, dA$

$(1 - x^2 - y^2)(2y^2 + x)$

$= 2y^2 - 2y^2x^2 - 2y^4 + x - x^3 - y^2x$

$\int\int_D (2x^2y + 2y^2 - 2y^2x^2 - 2y^4 + x - x^3 - y^2x)\, dx\, dy$

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

$= \boxed{\frac{19}{90}}$