"QUIZ" for Lecture 20

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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!

to get the point $(1,2,1)$, $u=1$ and $v=1$

$T_u = \langle 0, 1, 2u \rangle \quad T_v = \langle 2v, 1, 0 \rangle$

cross product: $\begin{vmatrix} i & j & k \\ 0 & 1 & 2u \\ 2v & 1 & 0 \end{vmatrix} = (0-2u)i - (0-2u(2v))j + (0-2v)k$

$N = \langle -2u, 4vu, -2v \rangle$

$N(1,1) = \langle -2, 4, -2 \rangle$

Tangent Plane: $-2(x-1) + 4(y-2) - 2(z-1) = 0$

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

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

$\boxed{-x + 2y - z = 2}$

2. Evaluate the surface integral

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

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

$\frac{x}{2} + \frac{y}{2} + \frac{z}{2} = 1$

$x + y + z = 2$

$z = 2 - x - y$

$y = 2 - x$

$x = 2 - y$

$ds = \sqrt{1 + (-1)^2 + (-1)^2} = \sqrt{3}$

$\iint_S ds = \int_0^1 \int_0^{2-x} \sqrt{3}\, dy\, dx$

$= \int_0^1 \left(\sqrt{3}\, y \Big|_0^{2-x} \right) dx = \sqrt{3} \int_0^1 2 - x\, dx$

$= \sqrt{3} \left(2x - \frac{x^2}{2} \right) \Big|_0^1 = \sqrt{3} \left(2 - \frac{1}{2} \right)$

$= \boxed{\sqrt{3} \left(\frac{3}{2} \right)}$