**"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!

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

$r_u = j + 2uk$

$r_v = 2vi + j$

$1 = v^2 \quad v = 1$

$2 = u + v \quad u = 1$

$1 = u^2$

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

$= -2ui + 4uvj - 2vk$

$@(1,2,1) = -2i + 4j - 2k$

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

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

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

**2.** Evaluate the surface integral

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

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

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

$x + y + z = 2$

$z = 2 - x - y$

$\iint_S z \, dS = \iint_D z\sqrt{(-1)^2 + (-1)^2 + 1} \, dA$

$= \sqrt{3} \iint_D z \, dA$

$\{(x,y) \in D \mid 0 \le x \le 2, \ 0 \le y \le -x+2\}$

$\sqrt{3}\int_0^2 \int_0^{-x+2} z \, dz \, dx = \sqrt{3}\left|\frac{z^2}{2}\right|_0^{-x+2} = \frac{(-x+2)^2}{2}\sqrt{3}$

$x^2 - 4x + 4$

$\frac{\sqrt{3}}{2}\int_0^2 (-x+2)^2 \, dx = \frac{\sqrt{3}}{2}\left|\frac{x^3}{3} - 2x^2 + 4x\right|_0^2 = \frac{4\sqrt{3}}{3}$