

QUIZ 20

Q1. Find an equation for the tangent plane to the parametric surface $x = v^2$ $y = u+v$ $z = u^2$

at the point $(1, 2, 1)$

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

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

$$\therefore u = 1 \quad v = 1$$

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

$$r_u = j + 2u \cdot k = (0, 1, 2u) = (0, 1, 2)$$

$$r_v = 2v i + j + 0k = (2v, 1, 0) = (2, 1, 0)$$

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

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

$$\cancel{-2} -x + 2y - z + 1 - 4 + 1 = 0$$

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

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

Q2. Evaluate the surface integral $\iint_S z \, dS$,

$(2, 0, 0)$ $(0, 2, 0)$ $(0, 0, 2)$

$$P = (2, 0, 0) \quad Q = (0, 2, 0) \quad R = (0, 0, 2)$$

$$PQ = (-2, 2, 0) \quad PR = (-2, 0, 2)$$

$$PQ \times PR = \begin{vmatrix} i & j & k \\ -2 & 2 & 0 \\ -2 & 0 & 2 \end{vmatrix} = 4i - (-4j) + (4)k \\ = (4, 4, 4)$$

$$4(x-2) + 4(y-0) + 4(z-0) = 0 \quad 4x + 4y + 4z - 8 = 0$$

$$x + y + z = 2$$

$$z = 2 - x - y$$



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$$z = g(x, y) = z - x - y.$$

~~$$\iint_S F \, dS = \iint$$~~

$$r = (u, v, z - x - y)$$

$$r_u = (1, 0, -1)$$

$$r_v = (0, 1, -1)$$

$$r_u \times r_v = (1, 1, 1)$$

$$|r_u \times r_v| = \sqrt{3}$$

$$\int_0^2 \int_0^{2-u} (2 - u - v) \cdot \sqrt{3} \, dv \, du$$

$$= \frac{4\sqrt{3}}{3}$$



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