

Yash Khangura "Quiz" for Lecture 25 Section 24

- 1.) Let $F(x, y, z) = \langle \cos(\sqrt{1+x^2} + zy^9), \tan(x^3 + y^2 + 1/z), \tan^{-1}(e^{xy^2} + \cos^6(x^2 - y + 3z)) \rangle$
 and let $\langle P, Q, R \rangle = \text{curl } F$, compute $dP/dx + dQ/dy + dR/dz$. Be sure to explain everything

$$\text{curl } F = \begin{vmatrix} \mathbf{i} & \mathbf{j} & \mathbf{k} \\ d/dx & d/dy & d/dz \\ \cos(\sqrt{1+x^2} + zy^9) & \tan(x^3 + y^2 + 1/z) & \tan^{-1}(e^{xy^2} + \cos^6(x^2 - y + 3z)) \end{vmatrix}$$

= 0 Divergence of curl is always 0!!!

- 2.) Calculate the surface integral $\iint_S F \cdot ds$, where $F(x, y, z) = \langle 2x + y + z, x + 2y + z, x + y + 2z \rangle$ where S is the surface of the box bounded by the planes $x=0, x=1, y=0, y=1, z=0, z=5$

$$dV F = \frac{d}{dx}(2x + y + z) + \frac{d}{dy}(x + 2y + z) + \frac{d}{dz}(x + y + 2z)$$

$$= 2 + 2 + 2 = 6$$

$$\int_0^5 \int_0^1 \int_0^1 6 \, dx \, dy \, dz = 120$$