

"QUIZ" for Lecture 25

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E-MAIL SCANNED .pdf OF COMPLETED QUIZ to DrZcalc3@gmail.com (Attachment: q25FirstLast.pdf) ASAP BUT NO LATER THAN Dec.8,2020, 8:00pm

Let

$$F(x, y, z) = \langle \cos(\sqrt{1+x^7+zy^9}), \tan(x^7+y^2+1/z), \tan^{-1}(e^{xyz} + \cos^6(x^8-y+3z)) \rangle,$$

and let $\langle P, Q, R \rangle = \text{curl } \mathbf{F}$. Compute

$$\frac{\partial P}{\partial x} + \frac{\partial Q}{\partial y} + \frac{\partial R}{\partial z}$$

Be sure to explain everything.

$$\frac{dP}{dx} + \frac{dQ}{dy} + \frac{dR}{dz} = 0$$

The divergence of the curl of a function is always 0.

2. Calculate the surface integral

$\iint_S \mathbf{F} \cdot d\mathbf{S}$, where

$$\mathbf{F}(x, y, z) = \langle 2x + y + z, x + 2y + z, x + y + 2z \rangle$$

where S is the surface of the box bounded by the planes $x = 0, x = 1, y = 0, y = 4, z = 0, z = 5$.

$$\iint_S \mathbf{F} \cdot d\mathbf{S} = \iiint_E \text{div}(\mathbf{F}) dV \quad E = \{(x, y, z) \mid 0 \leq x \leq 1, 0 \leq y \leq 4, 0 \leq z \leq 5\}$$

$$P_x = 2, \quad Q_y = 2, \quad R_z = 2 \quad \iiint_{0,0,0}^{1,4,5} 6 \, dx \, dy \, dz = \boxed{120}$$