"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

$$F(x,y,z) =$$

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

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

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

Be sure to explain everything.

0 because the divergence of curl is always zero.

2. Calculate the surface integral
$\int\int_S \mathbf{F}\cdot d\mathbf{S}$, 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 $x=0$, $x=1$, $y=0$, $y=4$, $z=0$, $z=5$.

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

$= 2+2+2 = 6$

$E = \{(x,y,z) \mid 0\le x\le 1,\ 0\le y\le 4,\ 0\le z\le 5\}$

$\int_0^1\int_0^4\int_0^5 6\,dz\,dy\,dx = 6z\Big|_0^5 = 30$

$30y\Big|_0^4 = 120$

$120x\Big|_0^1 = \boxed{120}$