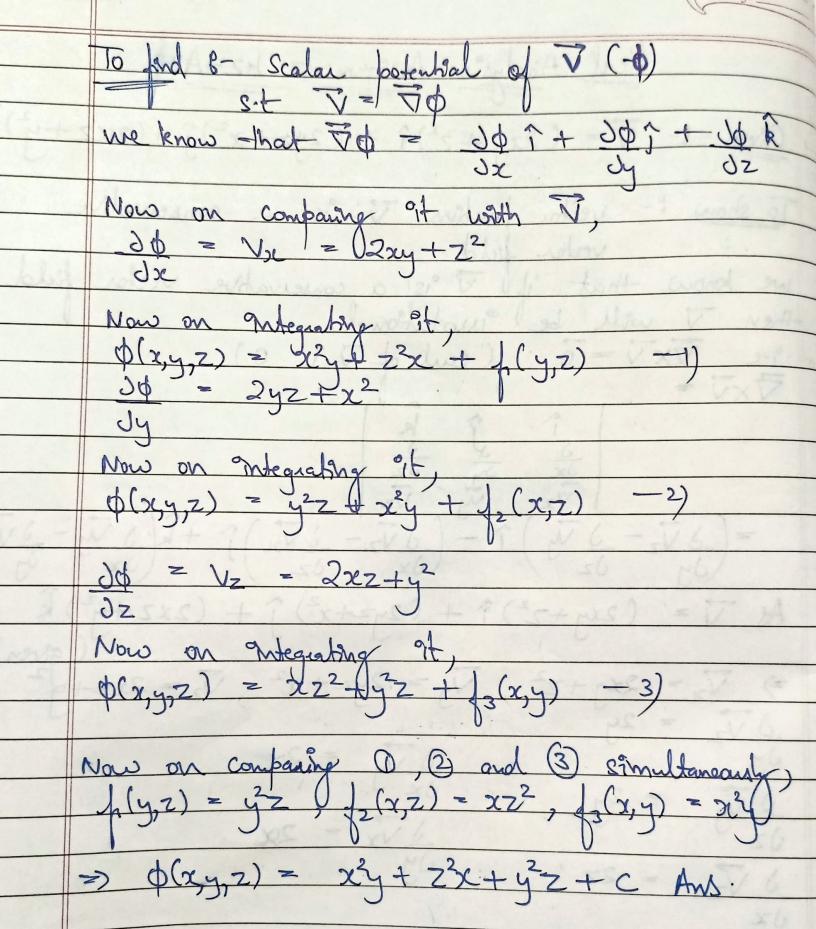
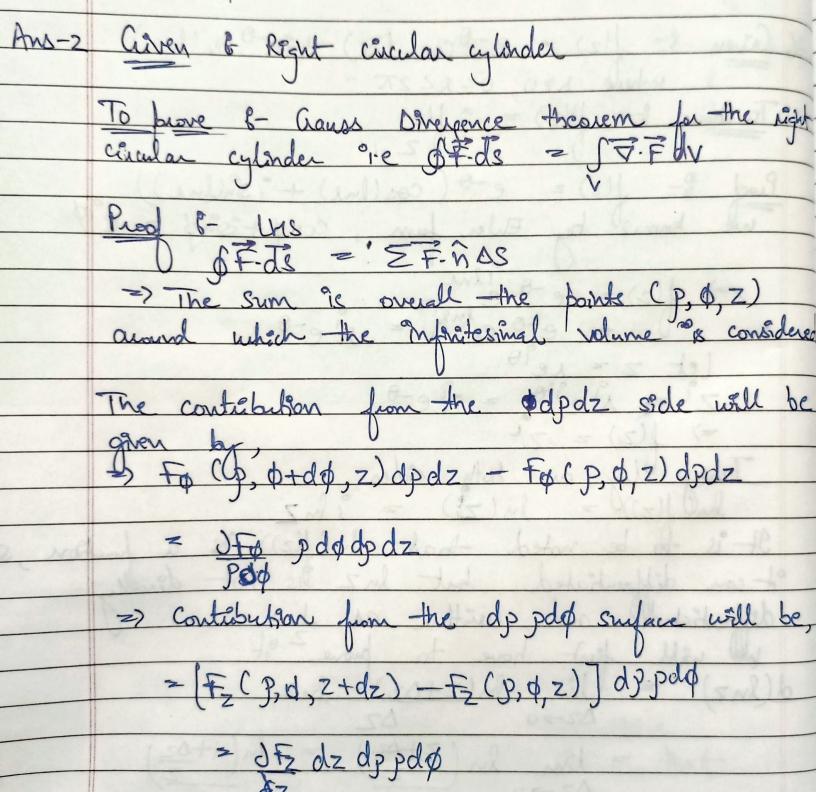


Real Analysis Assignment 42-A2 And Given 6- V = (2xy +z²)î + (2yz+x²)ĵ+(2xz+y²)k To show &- vector function V is a conservative V'is a conservative vector field -V 18 0) - (1 \v2 - 1 \v2) + k 1 \v2 - 1 \v2 \v2 (2yz+x²) j + (2xz+y²) k $2yz+x^2$, $\overline{V}_2=2xz+y^2$ 1 / = 2x Now butting values of all In TXV = (2y-2y) 1 = 1 2z-2z) +(2x-2x) \hat{k}

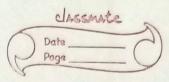
Hence of is showed that Vis a conservative vector field.





=> Contribution from the dz Pdø surface,

Fo (P+dP, Ø) z) dz pdø - Fp (P, Ø, E) dz gdø $[f_{\mathfrak{P}}(\mathfrak{P}+d\mathfrak{P},\mathfrak{p},z)-f_{\mathfrak{P}}(\mathfrak{P},\mathfrak{p},z)]dz$ = Ofp dpdz pdp Go Now Summing the contrabition from the mitesmal volume = 250 3db dpdzl + Ofp dpdzpdp + Ofz dzpdpdp Vb(7·F)dv = J. Fdv = RHS LHS = RMS Hence broved



ANS TO prove 8- $\nabla \times (\nabla \times \vec{A}) = \nabla (\nabla \cdot \vec{A}) - \nabla^2 \vec{A}$ roof 8- we will first calculate LHB and RHS

and then broke them equal.

Let $\vec{A} = Ax\hat{1} + Ay\hat{1} + Az\hat{k}$ $\vec{B} \times \vec{A} = \hat{1}$ Ax Ay Az

Ax Ay Az $= \left(\frac{\partial}{\partial x} - \frac{\partial}{\partial x}\right)\hat{i} - \hat{j}\left(\frac{\partial}{\partial x} - \frac{\partial}{\partial x}\right) + \left(\frac{\partial}{\partial x} - \frac{\partial}{\partial x}\right)$ 2/Az-JAy (2/Az-JAx) 2/Ay-2/Ax 3 (JAy - JAx) 1 + 2 (JAy - JA) - 2 (JAz - JA)

y (Jx) y + 2 (Jx - JA) / 2 (Jx) / 2 (Jx)

+ (-2) (JAz - JAx) - 2 (JAz - JAy) / R

dx (Jx) 2 / Jy (Jy) 2 / 2 / 2 $\frac{\partial^2 A_y}{\partial y \partial x} - \frac{\partial^2 A_x}{\partial y^2} + \frac{\partial^2 A_z}{\partial x \partial z} - \frac{\partial^2 A_{xx}}{\partial z^2}$ $+\left(-\frac{\partial^{2}A_{2}}{\partial x^{2}}+\frac{\partial^{2}A_{x}}{\partial x\partial z}-\frac{\partial^{2}A_{z}}{\partial y^{2}}+\frac{\partial^{2}A_{y}}{\partial y\partial z}\right)$

Now solving RMS

7. A = 0 2 Ax + 2 Ay + 2 Az

3x 3y 3z $\overline{A}(\overline{A},\overline{A}) = 3(3Ax + 3Ay + 3Ay)$ 3x(3x + 3y + 3x)+ J (JAX + JAy + JAZ) 1+ J (JAX + JAy + dA;

- J (JX) JZ (JX JY JZ $= \frac{3^{2}A_{x}}{3x^{2}} + \frac{3^{2}A_{y}}{3x^{2}} + \frac{$ = (12 Ax + J2 Ax + J2 Ax) 1 + (J2 A + J2 A + J2 A) J J22 J22 J22 + (12 Az + 12 Az) R Now doing $\overrightarrow{\nabla}(\overrightarrow{\nabla} \cdot \overrightarrow{A}) - \overrightarrow{\nabla} \overrightarrow{A}$ $= (0)^2 Ay + ||fAz|| - ||fAz|| - ||fAz|| + ||fAz|| - ||fAz|| + ||fAz|| - ||fAz|| + ||fAz|| +$ + ()2/Az + J2/Az - J2/Az - J2/Az)] + (J2Ax + PAy - J2Az - J2Az) R Jxvz Jzzy Jx2 Jyz) we can clearly see that LMS = RMS-Mence of It proved that $\vec{A} = \vec{A} =$

Ans-4 To Show 8- lim 223-1 = 00
Z-500 Z241 In order to prove that, $\frac{1}{1+z^2}$ If we prove that lim 1 => 0 they "it will Z>0 (2) aufomatically prove that ling 273-1 = 00 $\frac{1}{1} = \frac{2}{23} - 1 = 2 - 2^{3}$ $\frac{1}{2} = \frac{1}{1 + 1} = \frac{2}{2(1 + 2^{2})}$ > lim Z(1+22) As z-so => we are approaching to arigh.

So we know limit only exists if we find a directions. 1) Approachly along Y-axis i.e x=0 $\int_{0}^{\infty} \int_{0}^{\infty} |y| \left(\int_{0}^{\infty} \left(\frac{1}{y} \right)^{2} \right) = \frac{1}{2} \int_{0}^{\infty} \left(\frac{1-y^{2}}{y^{2}} \right) = 0$ $y \to 0$ $2 - (y)^{3}$ $2 + y^{3}$ Approaching along X-axis 9.e y=0 ly x(1+x2) = 0 2-73 3) Approaching along line y= ma and x >0 as z>0 2- (xt/mx)(xt/mx)(xt/mx) =0 Since we get 0 as a unique solution to the light when we approach organ from all derections. Kence—the limit exists and is legual to zero. So by this it is proved that 1 lin 223-1 = 10 Z->0 1+Z2

