Applied 354 Lecture Notes

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1 Notes: 02 Aug

Calculate Divergance Theorem Given the vector field, where $z = 0$: [1]

$$\underline{v} = 3y^2z\underline{i} + 2y^2\underline{j} + yz^2\underline{k} \tag{1}$$

$$\underline{v} = 2y^2\underline{j} \tag{2}$$

The divergance theorem is given by:

$$\iint_A \nabla \cdot \underline{v} dA = \oint \underline{n} \cdot \underline{v} dr \tag{3}$$

Calculating the inside of the LHS:

$$\nabla \cdot \underline{v} = \underline{j}\frac{\partial}{\partial y} \cdot 2y^2\underline{j} = 4y \tag{4}$$

Therefor calculating LHS:

$$\iint_A \nabla \cdot \underline{v}\ dA = \int_2^3 \int_2^4 4y\ dxdy \tag{5}$$

$$\iint_A \nabla \cdot \underline{v}\ dA = \left| 8\frac{y^2}{2} \right|_2^3 = 20 \tag{6}$$

Calculating the RHS, using the graphic finding the normal vectors to each side. Only two terms are present as i dot j will be zero, so the verticals are zero.

[1] hello my name is periwinkle and im so cute and hungry

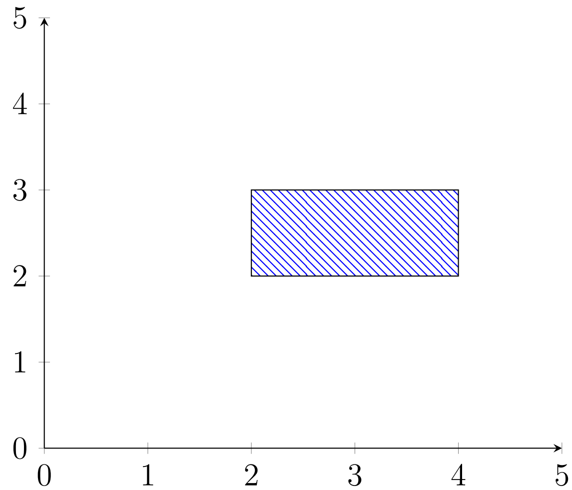
$$\oint \underline{n} \cdot \underline{v} dr = \int_2^4 -\underline{j} \cdot 2y^2 \underline{j} dx + \int_2^4 \underline{j} \cdot 2y^2 \underline{j} dx \tag{7}$$

Using Figure:1 replacing the y values from the graphic, 2 and 3 respectivly

$$= \int_2^4 -8dx + \int_2^4 18dx = 20 \tag{8}$$

Therefor RHS = LHS

Figure 1: Vector Field Figure



Calculate Stokes Integral Theorem for the velocity field $v = x\underline{j}$